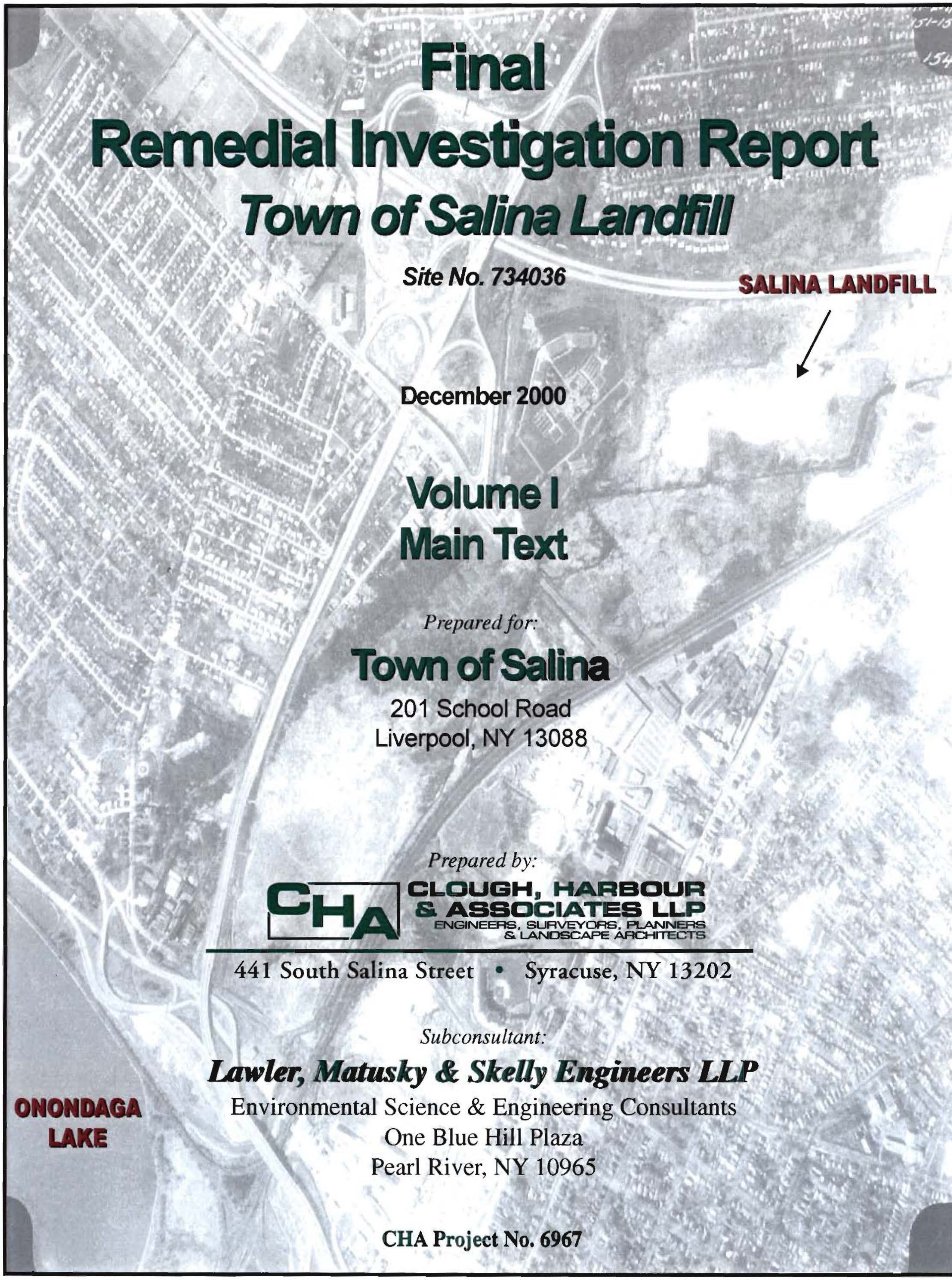

Final
Remedial Investigation Report
Town of Salina Landfill

Site No. 734036

December 2000

Volume I
Main Text

Prepared for:

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This Remedial Investigation Report was prepared in accordance with Work Plans dated:

May 15, 1998
July 14, 1999

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LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ARAR	Applicable or Relevant and Appropriate Requirements
ASP	Analytical Services Protocol
ASTM	American Society of Testing and Materials
AUF	Area Use Factor
AWQC	Ambient Water Quality Criteria
BOD	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHA	Clough, Harbour & Associates, LLP
CMP	Corrugated Metal Pipe
COC	Contaminants of Concern
COPC	Contaminants of Potential Concern
CSF	Cancer Slope Factor
DOT	Department of Transportation
DOW	Division of Water
DUSR	Data Usability Summary Report
E&E	Ecology & Environment, P.C.
EqP	Equilibrium Partitioning
ERA	Ecological Risk Assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
ER-L	Effect Range – Low
ER-M	Effect Range – Median
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
FWIA	Fish and Wildlife Impact Analysis
GCL	Geosynthetic Clay Liner
GPS	Global Positioning System
GRA	General Response Action
HDPE	High Density Polyethylene
HEAST	Health Effects Assessment Summary Tables
HELP	Hydrologic Evaluation Landfill Percolation
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IDLH	Immediately Dangerous to Life or Health
IRIS	Integrated Risk Information System
IRM	Interim Remedial Measures
LEL	Lowest Effect Level
LMS	Lawler, Matusky & Skelly Engineers LLP
LOAEL	Lowest Observable Adverse Effect Level

LIST OF ACRONYMS

MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MF	Modifying Factor
MNA	Monitored Natural Attenuation
MWS	Municipal Solid Waste
NCP	National Contingency Plan
NGVD	National Geodetic Vertical Datum
NiMo	Niagara Mohawk
NHP	Natural Heritage Program
NIOSH	National Institute for Occupational Safety and Health
NOAEL	No Observable Adverse Effect Level
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
NWI	National Wetland Inventory
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OB&G	O'Brien & Gere Engineers
OCDDS	Onondaga County Department of Drainage and Sanitation
OCRRA	Onondaga County Resource Recovery Agency
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
POTW	Publicly Owned Treatment Works
PPB	Particles per Billion
PPM	Particles per Million
PRAP	Proposed Remedial Action Plan
PVC	Polyvinyl Chloride
QC	Quality Control
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RECRA	RECRA Environmental, Inc.
REL	Recommended Exposure Act
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendment and Reauthorization Act
SCG	Standard, Criteria, and Guidance Value
SDWA	Safe Drinking Water Act
SEL	Severe Effect Level
SPDES	State Pollution Discharge Elimination System

LIST OF ACRONYMS

SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TBC	To Be Considered
TCL	Target Compound List
TDS	Total Dissolved Solids
TEF	Toxicity Equivalence Factor
TES	Threatened or Endangered Species
TIC	Tentatively Identified Compound
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TOGS	Technical and Operational Guidance Series
TRV	Toxicity Reference Value
TSCA	Toxic Substances Control Act
TWA	Time-Weighted Average
UF	Uncertainty Factor
ULI	Upstate Laboratories, Inc.
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UV	Ultra Violet
VOC	Volatile Organic Compound

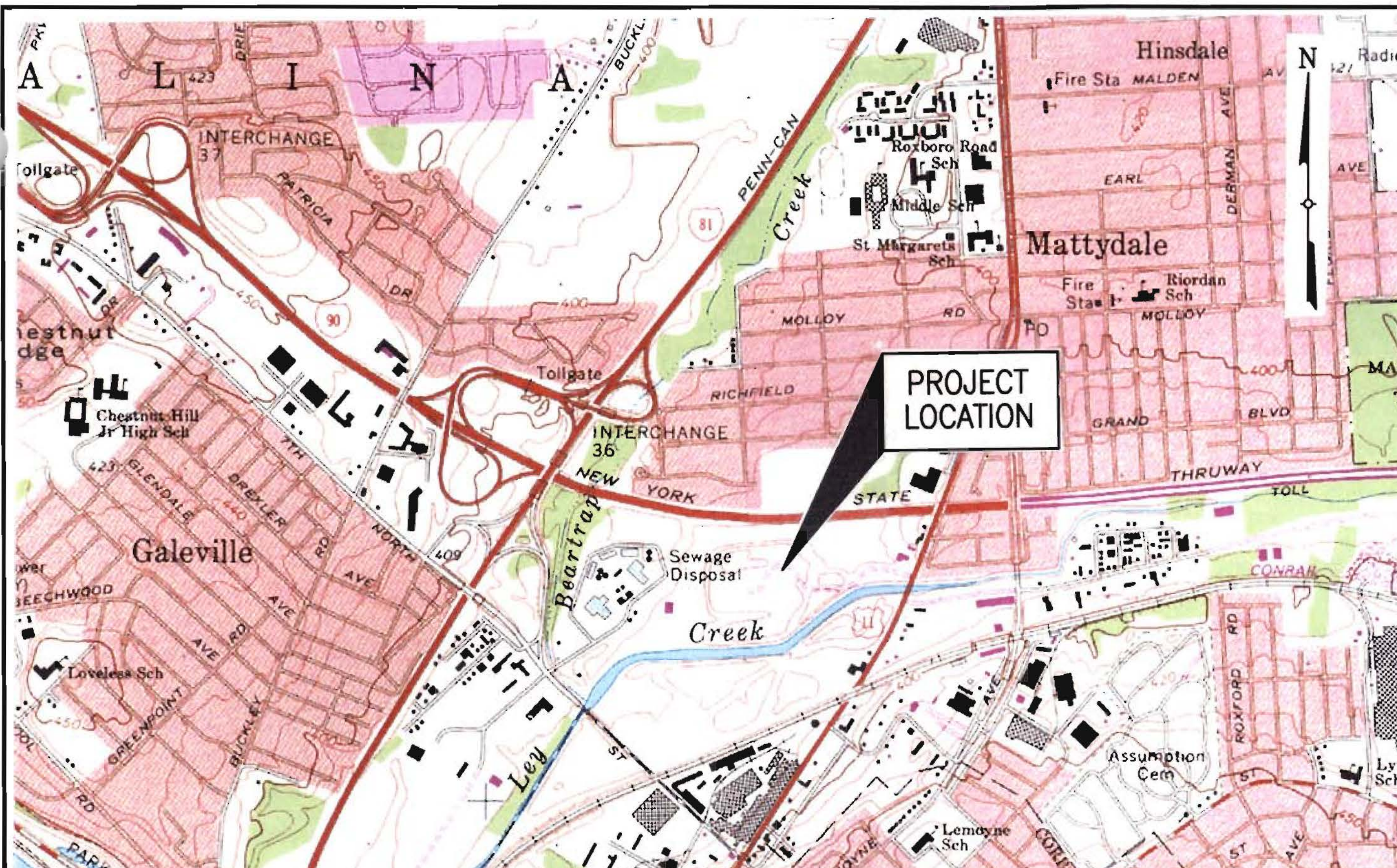
1.0 INTRODUCTION

Clough, Harbour & Associates LLP (CHA) was retained by the Town of Salina to perform a Remedial Investigation and Feasibility Study (RI/FS) of the former Town of Salina Landfill. The landfill has been designated a Class 2 Inactive Hazardous Waste Site by the New York State Department of Environmental Conservation (NYSDEC) and is also considered a subsite to the Onondaga Lake National Priorities List (NPL) site by the United States Environmental Protection Agency (USEPA). The Town of Salina Landfill is located off of Route 11 in the Town of Salina (Figure 1-1).

This draft report is an integrated document that includes a summary of the results of previous investigations (see Section 1.2.3) conducted at the Town of Salina Landfill, the results of two phases of field investigations conducted between 1998-1999 and an evaluation of risks to humans and the environment. In its final form, the RI/FS report will also include an evaluation of potential remedial alternatives for the site in the FS portion of the report. The work has been completed in accordance with an initial Work Plan submitted by CHA in May 1998 and a Phase II Investigation Work Plan submitted in July 1999.

The first phase field investigation was conducted between June and August 1998. Subsequent to the completion of the first phase field investigation, CHA prepared a work plan addendum to address the need for additional data from a review of data collected from the first phase field investigation. A second phase field investigation was completed between August and September 1999.

The risk assessments were performed by Lawler, Matusky & Skelly Engineers LLP (LMS) under subcontract agreement with CHA. The risk assessments incorporate relevant data from previous investigations performed on the site, as well as the relevant data collected during both phases of the current remedial investigation. It is important to note at the outset, that both the human health and ecological risk assessments presented in this report have been refined based on the submission and review of three previous Technical Memoranda. The first Technical Memorandum for the ecological risk assessment was submitted in October 1998, while a second Technical Memorandum for the ecological risk assessment was submitted in April 1999. One Technical Memorandum for the human health risk assessment was submitted in December 1998.



SOURCE: U.S.G.S. 7.5' TOPOGRAPHIC QUADRANGLE: SYRACUSE WEST, NY

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FIGURE 1–1

SITE LOCATION MAP

TOWN OF SALINA REMEDIAL INVESTIGATION

1.1 PROJECT OBJECTIVES

The final RI/FS report will consist of three major components: the remedial investigation, the risk assessment, and the feasibility study. The specific objectives of the remedial investigation include the following:

- Determine the physical setting of the site.

- Verify current landfill dimensions, soil properties, waste types and obtain other limited remedial design data to support the FS.

- Determine the nature and extent of contamination.

- Describe the fate and transport of the contaminants of concern (COCs).

The specific objectives of the risk assessment include the following:

- Identification of potential contaminants of concern for the site;

- Screening of the potential COCs via concentration-toxicity calculations;

- Completing an exposure assessment (i.e., qualitative and quantitative analyses of exposure pathways) for the site;

- Conducting toxicity assessment/hazard identification for the selected COCs; and

- Risk Characterization.

The specific objectives of the feasibility study include the following:

- Evaluate the need for possible Interim Remedial Measures (IRMs).

- Identify, screen, and evaluate potential remedial alternatives for the site, with a presumptive focus on containment, especially construction of a landfill cap. The "no-action" alternative will also be considered.

- Inform the public of investigation activities and their results, responding to concerns as required and appropriate under 6NYCRR Part 375, New York State Regulations for Inactive Hazardous Waste Sites.

1.2 BACKGROUND INFORMATION

1.2.1 Site Description

The Town of Salina Landfill has previously been defined as approximately 55 acres in size. The site is bounded by the New York State Thruway to the north and by Route 11 (Wolf Street) to the east. An Onondaga County Resource Recovery Agency (OCRRA) Transfer Station is located immediately to the west of the landfill. Historically, Ley Creek has been considered the southern boundary of the site, although recent information indicates that landfilled materials exist in one area south of Ley Creek. A portion of the Ley Creek channel was moved in the early 1970s. Landfilled materials have been identified in the area between the current Ley Creek Channel and the old Ley Creek Channel. It is important to note that the old Ley Creek Channel has been designated a Class 2 Inactive Hazardous Waste site by the NYSDEC (New York Registry No. 734074) and is not included within the boundaries of the Town of Salina Landfill site (see Figure 1-2).

Access to the site has historically been gained from Route 11. Until March of 2000, trespassers could enter the site on foot or by vehicle. Although one entrance to the site has a locked gate, it was possible to walk or drive around the gate on another dirt road. Once on the site, several well-worn paths provided vehicle access to most of the site. Recently, the Town has attempted to limit access to the site by placing barriers across the dirt access road. They have also placed additional signage indicating that no dumping is allowed on site.

The land containing the site is currently owned by five different parties as shown on Figure 1-3. The Town of Salina owns 29 acres of the site, comprising approximately the western half of the site. John and Frank Parratore currently own the land east of the Town property and west of Route 11. East Plaza, Inc. owns the portion of the site located between the current Ley Creek and old Ley Creek. Onondaga County owns a strip of land trending east-west across the site. Niagara Mohawk also owns a strip of land trending east-west across the site. The Onondaga County Resource Recovery Agency owns the property immediately west of the site and East Plaza, Inc. owns the land on the south side of Ley Creek.

The Salina Landfill is located within an area zoned as an Industrial District. Figure 1-4 depicts the zoning of land within ½ mile of the site. Land located immediately to the south and to the west of the site is also zoned as an Industrial District. The land directly east of the site, on the

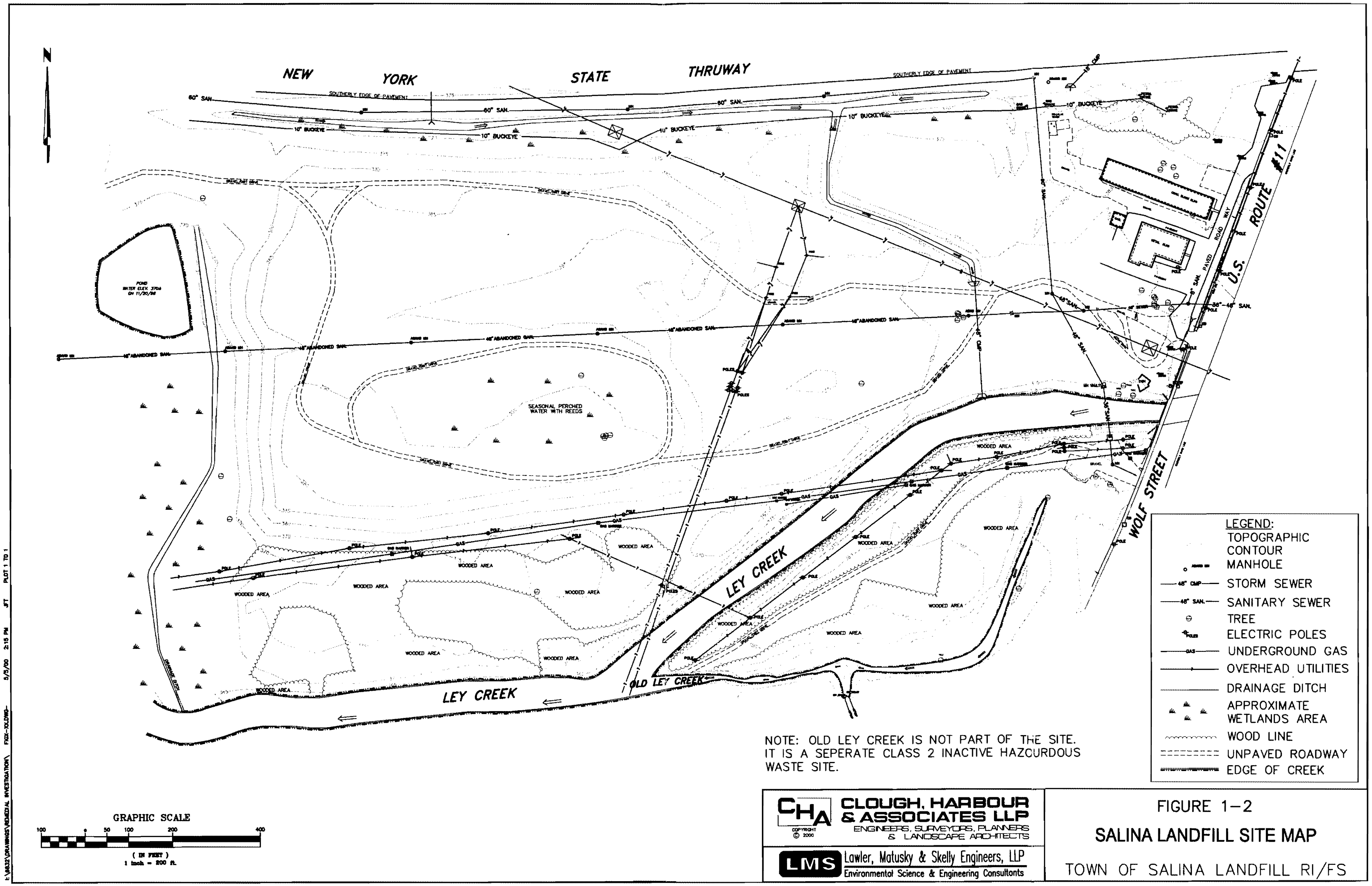


FIGURE 1-2

SALINA LANDFILL SITE MAP

TOWN OF SALINA LANDFILL RI/FS

opposite side of Wolf Street, is zoned both as a Highway Commercial District and a One-Family Residential District. The land located to the north of the site, on the opposite side of the New York State Thruway, is zoned as Open-land District, Planned Commercial District, and One-Family Residential District. Based on the Code of the Town of Salina, land within each zoning district has specific intended uses. The intended uses of each type of district in the immediate vicinity of the site is as follows:

- Industrial Districts - "to provide areas near or adjacent to highways ... for industrial, heavy commercial, and other uses generally not compatible with uses permitted in other districts"
- Open Land Districts – "to maintain a quality of environment to provide for leisure, recreational areas, baseball diamonds, walking trails, bicycle trails, swimming pools..."
- One- Family Residential Districts – "to provide areas for one-family dwellings on existing smaller sized lots and greater density that permitted in other one-family districts"
- Highway Commercial Districts – "to provides areas on highways designed to handle large traffic volumes for commercial uses"
- Planned Commercial Districts – "to provides areas on highways designed to handle large traffic volumes for well-planned and –designed commercial uses"

Based on the current zoning of the site, it would seem unlikely that the land could be used for purposes that would involve exposure to sensitive receptors (e.g., children, residents, etc.) Furthermore, based on discussions with the Town, there are no plans to change the zoning for any land zoned as industrial within the Town.

1.2.2 Site History

The Town of Salina has no records that indicate the actual date the Salina Landfill opened. However, in 1962 the Town Board closed the dump known as the "Mattydale Dump" pursuant to a court action. The Mattydale Dump was located in the vicinity of the current Town Garage off of Factory Avenue approximately ½ mile to the east of the site. With the close of the Mattydale Dump, it is believed that the Town proceeded to negotiate an agreement with the site property owner (East Plaza Inc.) to start landfill operations at the Wolf Street site. At the same time, the Town adopted a Garbage Collection Ordinance to regulate the collection of solid waste within the boundaries of the Town and to promote the public health, safety and welfare of the residents.

Unlike most municipalities in Onondaga County, the Town of Salina established residential refuse districts as early as 1941. As such, the Town Board would solicit bids from independent haulers and enter into a contract each year with the low bidder. The intent of the Landfill was to provide for the disposal of waste generated from within the town limits. Licensing procedures were adopted to monitor the disposal of waste and permits were issued to haulers doing business in the Town. Over the next eight years, the landfill was monitored for state compliance and some complaints were received. In 1970, periodic checks on the Landfill indicated that in addition to waste generated within the Town, additional tonnage was coming from outside areas. The Highway Superintendent reported that the Landfill was reaching capacity and suggested that the boundaries be expanded up to Route 81 or additional property be purchased.

In 1971, several complaints were made by the NYS Thruway Authority because refuse was being left uncovered and debris was blowing over the Thruway. The Thruway Authority requested that the Town cover the landfill. Due to the capacity problems, the Town Board started looking into other solid waste disposal options, such as purchasing additional property to start another landfill, building an incinerator, or using the shredding plant which was being constructed by the City of Syracuse.

The City of Syracuse was also operating a Landfill in the Town of Salina. In 1968, the City started using property on 7th North Street along the South side of Ley Creek for disposal of solid waste until the site was closed in 1971 pursuant to litigation proceedings.

Between 1971 and 1974, the landfill operations continued with little or no control over the refuse haulers that were dumping in the Landfill. Town records indicate that the trucks with permit stickers were not checked for source or quantity of refuse and that they were on the "honor system" and that only town residents that brought their own refuse to the Landfill were checked. Reaching its capacity, the landfill was officially closed sometime in late 1974 or early 1975, pursuant to an order by the New York State Department of Environmental Conservation.

In 1976, specifications were prepared and approved by the NYSDEC for dirt fill and grading of the site. However, litigation proceedings commenced between the Town of Salina and the property owner East Plaza, Inc. and in 1981 the Town was required to purchase the western portion of the site (approximately 29 acres). Once again specifications were prepared and approved by the NYSDEC in July 1981.

In September 1981, the Town awarded a contract to cover the Landfill with a two-foot clay-type soil. Once the soil was placed, the area was hydroseeded to establish a vegetative cover. This project was completed in November of 1982. The site remained untouched thereafter to the present time.

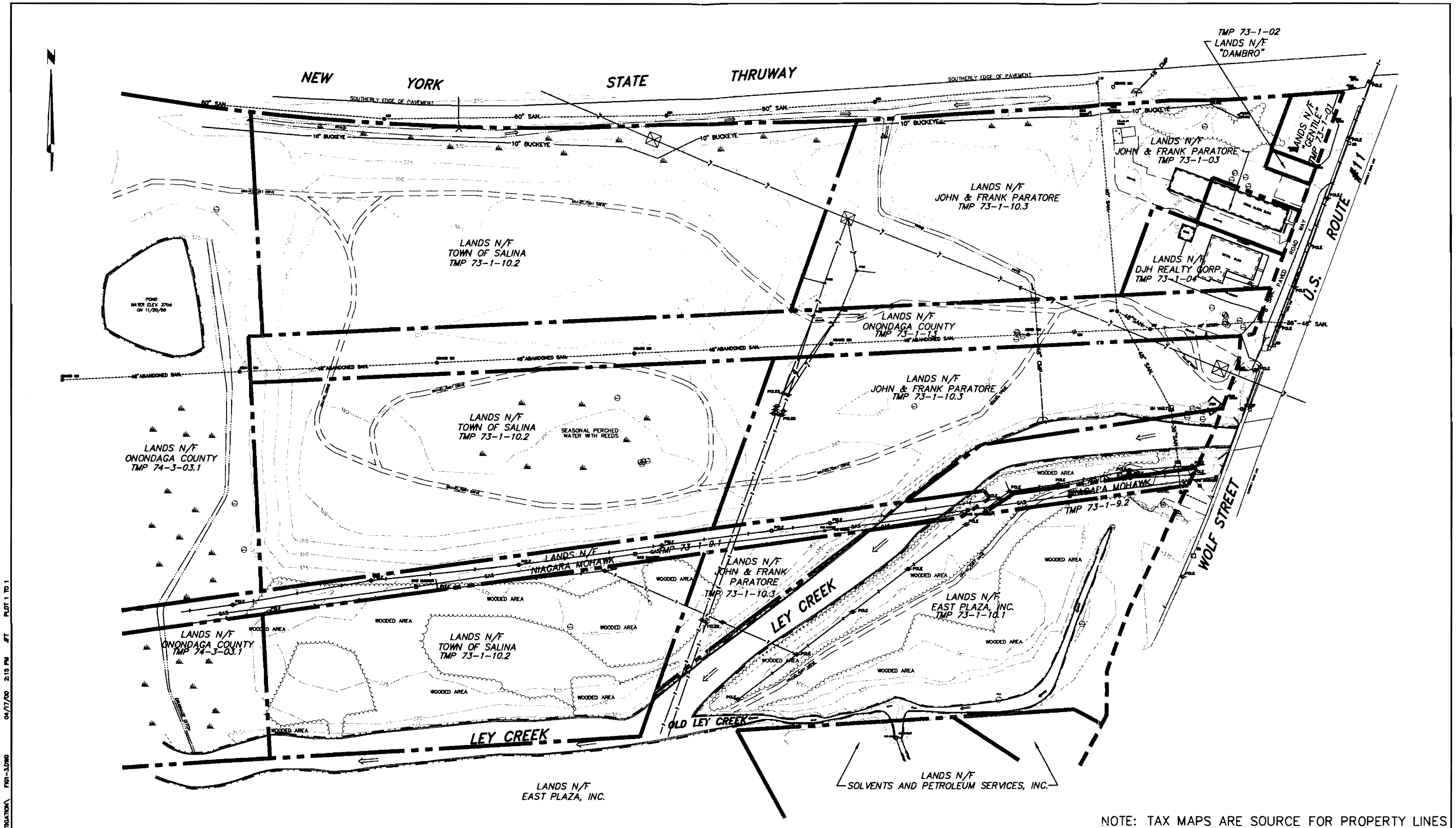
1.2.3 Previous Investigations

Several investigations have been conducted at the Town of Salina Landfill since the late 1980s. Figure 1-5 shows the location of all samples collected during all of the previous investigations. Information regarding the agency or company that collected the sample and the year the sample was collected is also provided on this figure. Where available, sampling data from these previous investigations have been summarized in tables included in this section. Sampling data have been compared to current standards or guidelines appropriate for specific media.

The earliest investigations were conducted by NYSDEC and the NUS Corporation on behalf of the United States Environmental Protection Agency (USEPA) in 1986 (NYSDEC 1987 Memorandum). In 1986, the NYSDEC collected three surface water samples and two surface soil samples. The surface water samples were collected from drainage ditches near the Thruway. The surface soil samples were collected near the north bank of Ley Creek. All samples were analyzed for PCBs. No PCBs were detected in the water samples, but PCBs were detected in the soil samples at up to 3.6 mg/kg. These sampling locations are depicted on Figure 1-5 and labeled NYSDEC '86. The location of one of the surface water samples could not be determined based on available information.

In 1986, NUS Corporation collected 5 surface soil samples (NYT1-S1 through NYT1-S5), 2 surface water and sediment samples from Ley Creek and another surface water and sediment sample from an on-site drainage ditch (NYT1-SW1/SED1 through NYT1-SW3/SED3). The complete analytical results for these samples were not available in the files reviewed by CHA. However, a memorandum by the NYSDEC indicates that surface soils are contaminated with semi-volatile organic compounds (SVOCs) and some heavy metals, and no significant increase was noted in surface water concentrations between upstream and downstream locations. PCBs were not detected in any of the samples collected by the NUS Corporation (NYSDEC 1987 Memorandum).

In 1987, the NYSDEC retained Atlantic Testing Laboratories to drill three borings on site (SW-1, SW-2 and SW-3). Subsurface soil samples were collected from all three borings. Boring SW-1 was completed as a monitoring well and a groundwater sample was collected. This monitoring well was later renamed as MW-0. Samples were analyzed for VOCs, SVOCs, Pesticides and



NOTE: TAX MAPS ARE SOURCE FOR PROPERTY LINES

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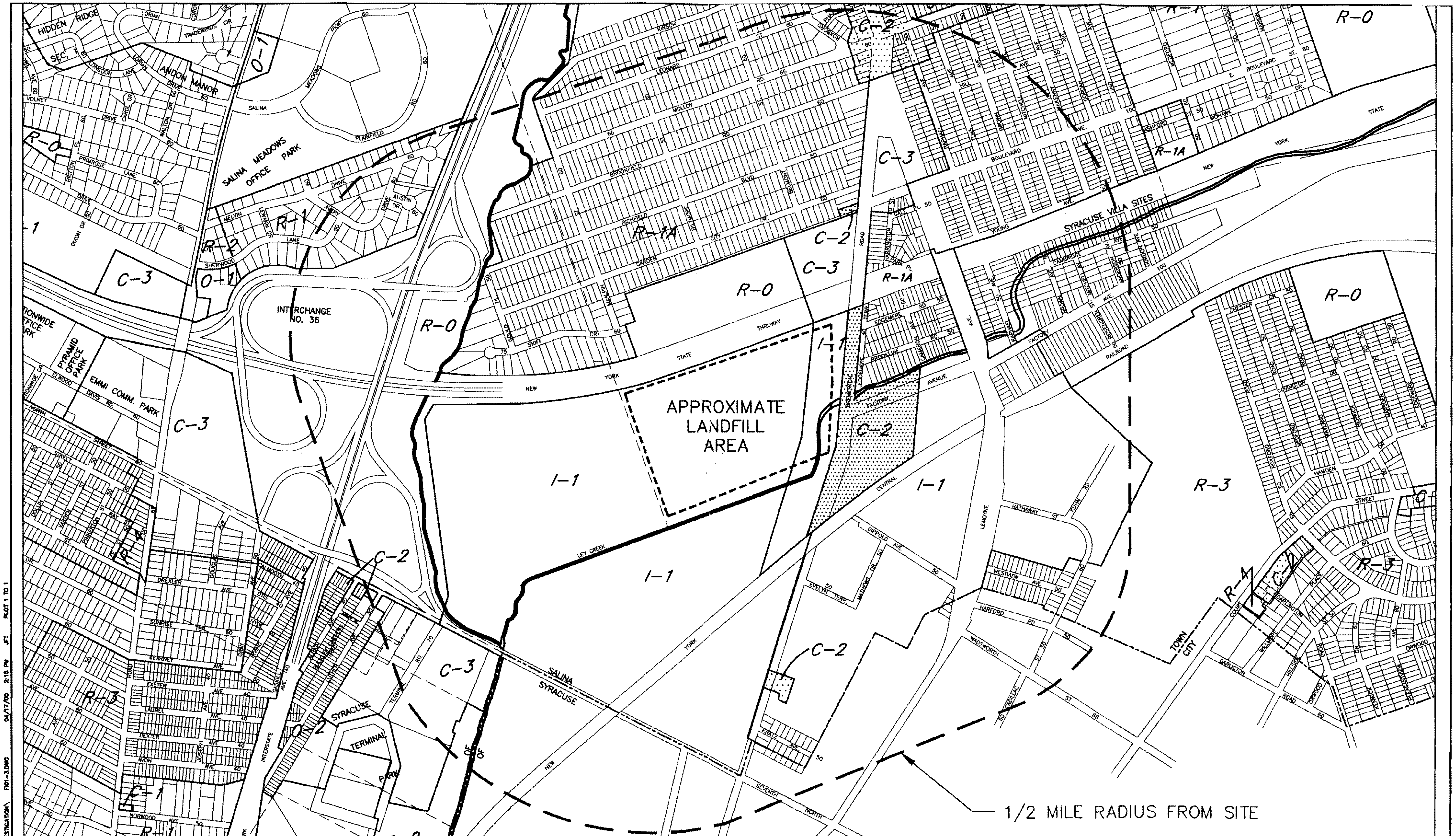
FIGURE 1–3

SITE OWNERSHIP MAP

TOWN OF SALINA LANDFILL RI/FS



GRAPHIC SCALE

(IN FEET)
1 inch = 500 ft.

LEGEND:

I-1	INDUSTRIAL DISTRICT
C-2	HIGHWAY COMMERCIAL DISTRICT
C-3	PLANNED COMMERCIAL DISTRICT
R-O	OPEN-LAND DISTRICT
R-1A	ONE-FAMILY RESIDENTIAL DISTRICT

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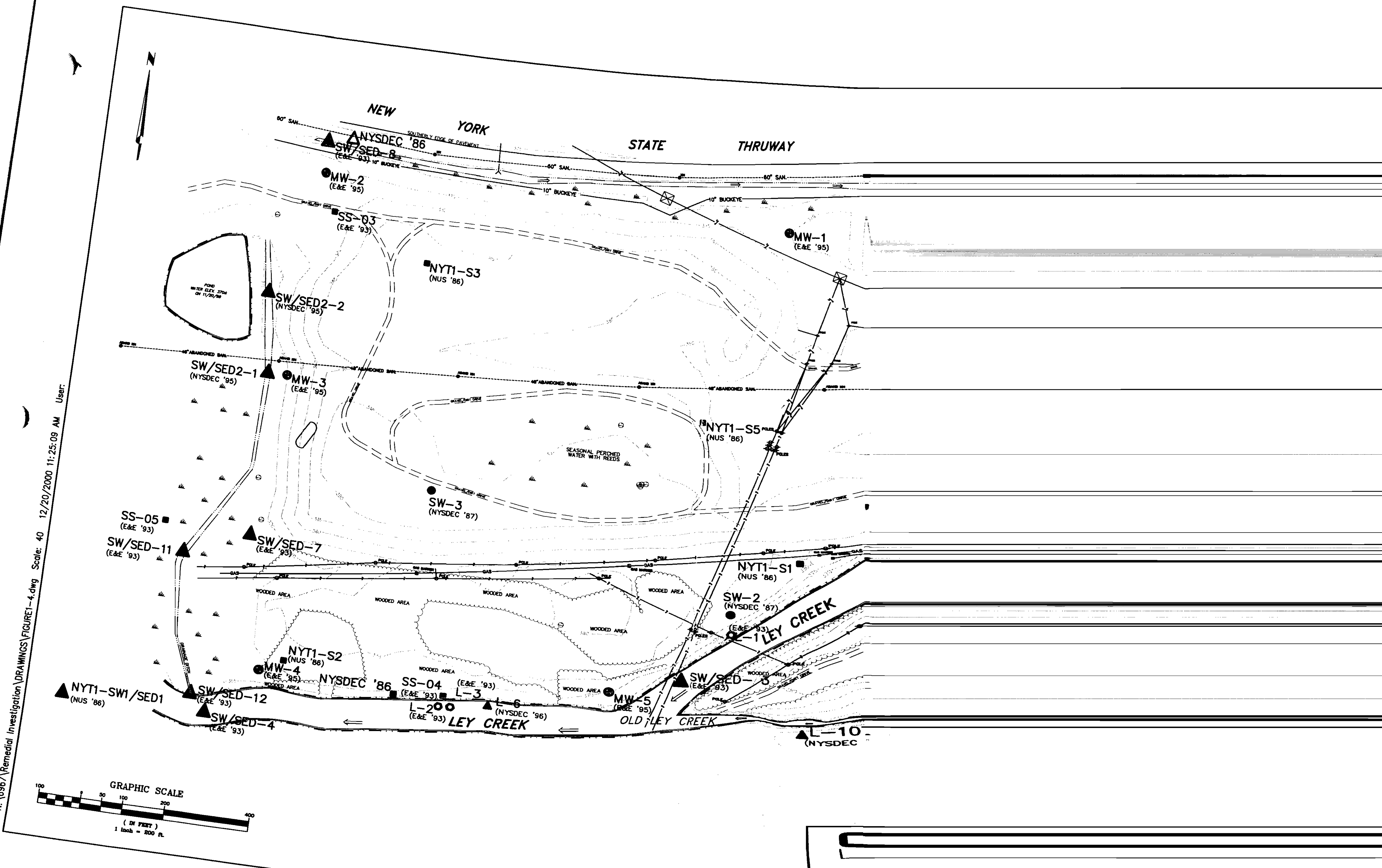
FIGURE 1-4

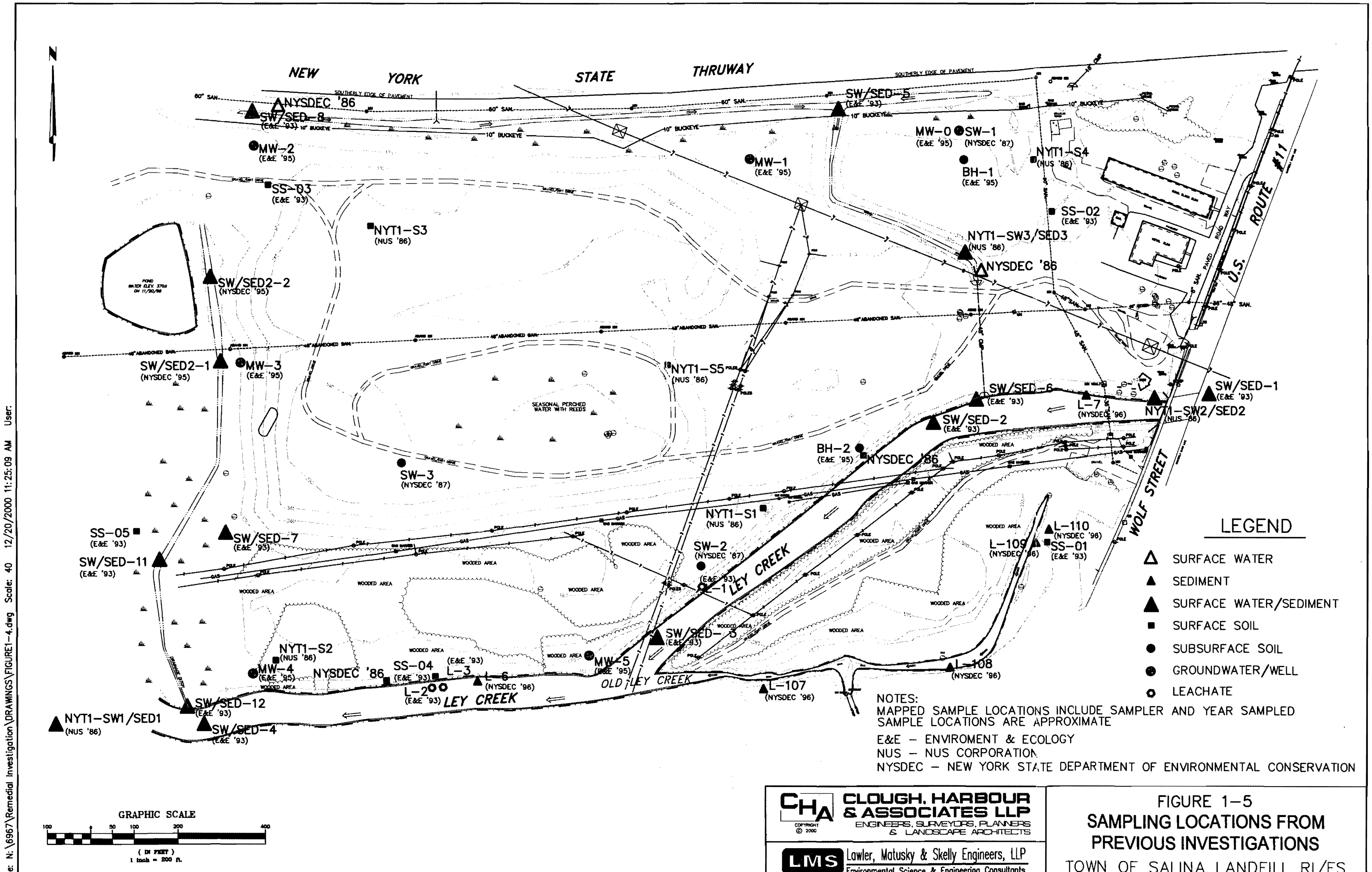
ZONING MAP

TOWN OF SALINA LANDFILL RI/FS

t:\6832\DRAWINGS\REMEDIAL INVESTIGATION\ FIG1-3.DWG 04/17/00 2:15 PM JFT PLOT 1 TO 1

File: N:\6967\Remedial Investigation\DRAWINGS\FIGURE1-4.dwg Scale: 40 12/20/2000 11:25:09 AM User:





NOTES:
MAPPED SAMPLE LOCATIONS INCLUDE SAMPLER AND YEAR SAMPLED
SAMPLE LOCATIONS ARE APPROXIMATE

E&E – ENVIROMENT & ECOLOGY
NUS – NUS CORPORATION
NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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FIGURE 1–5
SAMPLING LOCATIONS FROM PREVIOUS INVESTIGATIONS
TOWN OF SALINA LANDFILL RI/FS

File: N:\6967\Remedial Investigation\DRAWINGS\FIGURE1-4.dwg Scale: 40 12/20/2000 11:25:09 AM User:

TABLE 1-2
TOWN OF SALINA LANDFILL
SUMMARY OF PARAMETERS DETECTED IN SURFACE WATER
ECOLOGY AND ENVIRONMENT (1994)

			LEY CREEK					DRAINAGEWAYS				
LOCATION		**NY Std.[1]**	**SW-1**	**SW-2**	**SW-3**	**SW-4**	**SW-6**	**SW-5**	**SW-7**	**SW-8**	**SW-11**	**SW-12**
VOCs	**Units**											
Acetone	ug/l	-	ND	ND	ND	ND	ND	ND	ND	ND	160	ND
Carbon Disulfide	ug/l	-	ND	ND	ND	ND	ND	ND	ND	ND	5 J	ND
Vinyl chloride	ug/l	0.3	ND	**9** J	ND	ND	ND	ND	ND	ND	ND	ND
Total 1,2-Dichloroethene	ug/l	-	ND	15	5 J	5 J	31	ND	ND	ND	ND	**3** J
1,2-Dichloroethane	ug/l	-	5 J	5 J	8 J	9 J	9 J	7 J	ND	ND	ND	ND
1,1,1-Trichloroethane	ug/l	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	**5** J
Toluene	ug/l	6000	ND	2 J	ND	ND	7 J	ND	ND	ND	ND	ND
SVOCs												
1,4-Dichlorobenzene	ug/l	5	ND	ND	2 J	ND	ND	ND	ND	ND	ND	ND
Pesticides/PCBs	ug/l		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals												
Aluminum	ug/l	100	**157**	**150**	**179**	**607**	95.3	**539**	**2580**	**205**	NA	NA
Arsenic	ug/l	150	1.6	3.1	2.9	2.7	4.5	5.8	17.6	20.8	NA	NA
Barium	ug/l	-	83.2	87.7	86.3	82.3	105	101	3420	99.5	NA	NA
Cadmium	ug/l	8.20	ND	ND	ND	ND	ND	ND	**13**	ND	NA	NA
Calcium	ug/l	-	183000	166000	182000	178000	125000	124000	204000	130000	NA	NA
Chromium	ug/l	308.02	ND	ND	ND	ND	ND	6.3	95.6	6.1	NA	NA
Cobalt	ug/l	5	ND	ND	ND	ND	ND	ND	**55.2**	ND	NA	NA
Copper	ug/l	39.59	2.4	2.1	3.2	8.2	ND	ND	**139**	2.8	NA	NA
Iron	ug/l	300	**372**	**456**	**479**	**1660**	**362**	**421**	**244000**	**2500**	NA	NA
Lead	ug/l	23.54	3	2.4	4.7	9.5	ND	ND	**87.3**	1.7	NA	NA
Magnesium	ug/l	-	30400	33500	31900	317000	43600	43100	66000	42800	NA	NA
Maganese	ug/l	-	71.4	92.9	101	182	44.1	77.2	738	71.4	NA	NA
Nickel	ug/l	227.14	ND	ND	ND	ND	ND	ND	96.4	ND	NA	NA
Potassium	ug/l	-	5680	3630	4510	5050	2790	2760	87600	2500	NA	NA
Sodium	ug/l	-	111000	105000	111000	110000	105000	100000	235000	70400	NA	NA
Vanadium	ug/l	14	ND	ND	ND	ND	ND	ND	**25.5**	ND	NA	NA
Zinc	ug/l	133.33	53.6	46.5	37.6	77.1	16	30.9	**275**	104	NA	NA
Cyanide	ug/l	9000	ND	ND	ND	ND	ND	ND	28	ND	NA	NA
Total Hardness	mg/l	Avg = 569	583	552	586	575	492	487	780	500	NA	NA

Notes:

1. Shaded, Boldface Values Exceed NYS Standard or Guidance Value for Class B Waters Defined in TOGS 1.1.1 - June 1998.
   Standard for certain metals listed below based on hardness
   Cadmium standard = (0.85)exp(0.7852[ln hardness]-2.715
   Chromium standard = (0.86)exp(0.819[ln hardness]+ .6848
   Copper standard = (0.96)exp(0.8545[ln hardness]-1.702
   Lead standard = {1.46203 -[ln hardness (0.145712)]} exp(1.273 [ln hardness]-4.297
   Nickel standard = (0.997)exp(0.846[ln hardness]+0.0584
   Zinc standard = exp(0.85[ln hardness]+0.50)

TABLE 1-3
TOWN OF SALINA LANDFILL
SUMMARY OF PARAMETERS DETECTED IN SEDIMENT
ECOLOGY AND ENVIRONMENT (1994)

				Ley Creek					Drainageways				
LOCATION		NY Std.[2]	Site Specific[3]	SED-1	SED-2	SED-3	SED-4	SED-6	SED-5	SED-7	SED-8	SED-11	SED-12
VOCs	**Units**												
Acetone	ug/kg	-		ND	ND	ND	ND	ND	170	ND	84	120	89
Total 1,2-Dichloroethene	ug/kg	0.7	1.5	ND	**5** J	ND	ND	ND	ND	ND	ND	ND	**5** J
Toluene	ug/kg	-		ND	ND	3 J	ND	1 J	ND	ND	ND	ND	ND
Chlorobenzene	ug/kg	3.5	7.5	ND	ND	**32** J	ND	ND	ND	ND	ND	ND	ND
SVOCs													
Pentachlorophenol	ug/kg	40	86	110 J	ND	ND	ND	ND	ND	ND	ND	NA	NA
Carbazole	ug/kg	-		79 J	420 J	130 J	180 J	110 J	ND	ND	ND	NA	NA
Dibenzofuran	ug/kg	-		ND	200 J	ND	ND	ND	ND	ND	ND	NA	NA
Total PAHs	ug/kg	-		7300 J	30000 J	12000 J	18000 J	8600 J	530	3000 J	1700 J	NA	NA
Pesticides													
4,4'-DDD	ug/kg	0.01	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	**26** J
4,4'-DDT	ug/kg	0.01	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	**40** J
PCBs													
Aroclor-1242	ug/kg	0.0008	0.002	**2200** J	**1200**	**1200**	**2000**	ND	ND	**370**	ND	ND	ND
Aroclor-1248	ug/kg	0.0008	0.002	ND	ND	ND	ND	**570**	ND	ND	ND	**770**	**7100**
Aroclor-1254	ug/kg	0.0008	0.002	ND	ND	ND	ND	ND	ND	ND	ND	**570** J	**3100**
Metals													
Aluminum	mg/kg	-		2790	4120	6710	6060	6050	10300	6160	1080	NA	NA
Antimony	mg/kg	2		ND	ND	ND	ND	ND	**91.5**	ND	ND	NA	NA
Arsenic	mg/kg	6		2.9	5.4	5.2	**6.5**	**8.9**	**40.9**	4	**117**	NA	NA
Barium	mg/kg	-		40.2	54.5	93.4	78.9	75.8	198	347	237	NA	NA
Beryllium	mg/kg	-		ND	ND	0.42	ND	ND	ND	ND	ND	NA	NA
Cadmium	mg/kg	0.6		ND	ND	**2.2**	**1.7**	ND	ND	**7.4**	ND	NA	NA
Calcium	mg/kg	-		103000	48900	59800	59700	52700	69000	56200	86500	NA	NA
Chromium	mg/kg	26		**28.3**	**29**	**44.3**	**56.6**	**34**	**28.1**	**109**	ND	NA	NA
Cobalt	mg/kg	16		4.5	6.2	6.5	6	5.9	14.6	**17.9**	7.9	NA	NA
Copper	mg/kg	-		70.7	56.2	76.6	82.1	54.3	47.6	146	16.9	NA	NA
Iron	mg/kg	2,000,000		12100	11500	13000	14900	15800	34200	54500	24400	NA	NA
Lead	mg/kg	31		**83.5**	**72.1**	**84.2**	**81.3**	**98**	**61.8**	**151**	**35.6**	NA	NA
Magnesium	mg/kg	-		12500	12400	15700	15200	15700	20800	2080	5360	NA	NA
Manganese	mg/kg	460		223	222	247	274	356	**476**	363	129	NA	NA
Nickel	mg/kg	16		16	**19.5**	**40**	**27**	**21.6**	**40.9**	**51.8**	11.8	NA	NA
Potassium	mg/kg	-		429	813	1780	1350	1580	3070	1400	ND	NA	NA
Selenium	mg/kg	-		ND	0.46	ND	ND	ND	ND	ND	ND	NA	NA
Silver	mg/kg	1		ND	ND	ND	ND	ND	**5.2**	ND	ND	NA	NA
Sodium	mg/kg	-		ND	ND	ND	ND	ND	ND	741	806	NA	NA
Thallium	mg/kg	-		ND	ND	0.43	ND	ND	ND	ND	ND	NA	NA
Vanadium	mg/kg	-		9.7	13.7	22.2	20.6	179	33.7	22	5.5	NA	NA
Zinc	mg/kg	120		**133**	**176**	**223**	**246**	**262**	**223**	**304**	73.3	NA	NA
Cyanide	mg/kg	-		0.82	1.4	ND	ND	ND	3.4	ND	ND	NA	NA

Notes:

1. Shaded, Boldface Values Exceed Guidance Values determined according to the NYSDEC's Technical Guidance for Screening Contaminated Sediments 1998.
2. Values shown for VOCs, SVOCs, Pesticides, and PCBs have units of ug/g-oc (oc=organic carbon). Values shown for metals have units of mg/kg and are based on lowest effect level.
3. Site-Specific Standards for organic compounds have units of ug/kg and were calculated using sediment criteria for protection of human health and site-specific organic carbon content of 2151 mg/kg from 1998 RI data. If no criteria existed for protection of human health, next most stringent criteria used.

TABLE 1-7
TOWN OF SALINA LANDFILL
SUMMARY OF PARAMETERS DETECTED IN GROUNDWATER
ECOLOGY AND ENVIRONMENT (1996)

LOCATION		NY Std.	MW-0	MW-1	MW-2	MW-3	MW-4	MW-5
VOCs	**Units**							
Chloroethane	ug/l	5	ND	ND	ND	**360**	ND	ND
Total 1,2-Dichloroethene	ug/l	5	ND	ND	ND	**64**	ND	ND
Trichloroethene	ug/l	5	ND	ND	ND	**14**	ND	ND
Benzene	ug/l	1	ND	**4** J	**5** J	ND	ND	ND
Toluene	ug/l	5	ND	1 J	ND	3 J	ND	ND
Chlorobenzene	ug/l	5	ND	**10**	ND	ND	ND	ND
Ethylbenzene	ug/l	5	ND	2 J	3 J	4 J		ND
Total Xylenes	ug/l	5	ND	**24**	**26**	**7** J	ND	ND
SVOCs								
Phenol	ug/l	1	ND	ND	**4** J	ND	ND	ND
1,4-Dichlorobenzene	ug/l	3	ND	2 J	ND	ND	ND	ND
2-Methylphenol	ug/l	-	ND	12	ND	ND	ND	ND
4-Methylphenol	ug/l	-	ND	ND	3 J	ND	1 J	ND
Naphthalene	ug/l	10	ND	5 J	1 J	ND	ND	ND
Diethylphthalate	ug/l	5	ND	5 J	ND	ND	ND	ND
Carbazole	ug/l	-	ND	ND	3 J	ND	ND	ND
Di-n-butylphthalte	ug/l	-	ND	1 J	ND	ND	ND	ND
Butylbenzlphthalate	ug/l	50	1 J	1 J	ND	ND	ND	ND
Pesticides/PCBs								
Aroclor 1242	ug/l	0.09	ND	ND	ND	ND	ND	**1.1**
Metals								
Aluminum	ug/l	-	187,000	33000	10600	25200	159000	169000
Aluminum - dissolved	ug/l	-	342	153	135	306	148	84.4
Antimony	ug/l	3	ND	ND	ND	ND	ND	ND
Antimony - dissolved	ug/l	3	ND	ND	ND	ND	ND	53.9
Arsenic	ug/l	25	**116**	21.4	22.3	**35.4**	**78.7**	**153**
Arsenic - dissolved	ug/l	25	18.8	ND	ND	6.2	5.7	13
Barium	ug/l	1000	**2600**	942	910	**1500**	**1490**	**1110**
Barium - dissolved	ug/l	100	**867**	**517**	**640**	**1100**	**387**	**187**
Beryllium	ug/l	3	12.9	3.1	1.9	2.1	**11.9**	**10.4**
Beryllium - dissolved	ug/l	3	ND	ND	ND	ND	ND	ND
Cadmium	ug/l	5	4.6	ND	ND	ND	**17.7**	4
Cadmium - dissolved	ug/l	5	ND	ND	ND	ND	ND	ND
Calcium	ug/l	-	1240000	396000	309000	222000	1700000	1960000
Calcium - dissolved	ug/l	-	245000	182000	177000	161000	20800	114000
Chromium	ug/l	50	**252**	**51.5**	19.6	35	**325**	**221**
Chromium - dissolved	ug/l	50	ND	ND	ND	ND	ND	ND
Cobalt	ug/l	-	206	61.8	29.5	40.6	200	228
Cobalt - dissolved	ug/l	-	16.4	16.2	14	16.9	9.8	6.2
Copper	ug/l	200	**495**	**210**	38.1	91.9	**519**	**412**
Copper - dissolved	ug/l	200	4.7	ND	ND	4.2	5.2	3.9
Iron	ug/l	300	**330000**	**155000**	**69300**	**94600**	**347000**	**302000**
Iron - dissolved	ug/l	300	**33500**	**64500**	**36300**	**34800**	**24400**	80.3
Lead	ug/l	25	**296**	**76.5**	**96.8**	**62.2**	**227**	**191**
Lead - dissolved	ug/l	25	ND	ND	ND	ND	ND	ND
Magnesium	ug/l	35000	**323000**	**122000**	**81400**	**97400**	**545000**	**594000**
Magnesium - dissolved	ug/l	35000	**72100**	**61000**	**70900**	68300	46900	**37200**
Manganese	ug/l	300	**7510**	**2360**	**850**	**742**	**9460**	**11000**
Manganese - dissolved	ug/l	300	**356**	**559**	**496**	229	**780**	76.1
Mercury	ug/l	0.7	**0.88**	0.45	ND	ND	0.45	ND
Mercury - dissolved	ug/l	0.7	ND	ND	ND	ND	ND	ND
Nickel	ug/l	100	**357**	**105**	46.3	92.7	**378**	**375**
Nickel - dissolved	ug/l	100	ND	13.5	22.3	43.3	ND	ND
Potassium	ug/l	-	40000	43400	62800	142000	45500	30800
Potassium - dissolved	ug/l	-	14900	36000	60500	132000	24100	4440
Silver	ug/l	50	30	14.9	9.2	9.6	34.7	27.8
Silver - dissolved	ug/l	50	ND	ND	ND	ND	ND	ND
Sodium	ug/l	20000	**118000**	**154000**	**219000**	**382000**	**76000**	33200
Sodium - dissolved	ug/l	20000	**108000**	**143000**	**220000**	**366000**	**61600**	23400
Vanadium	ug/l	-	276	54.7	65.5	40.5	341	259
Vanadium - dissolved	ug/l	-	ND	ND	ND	ND	ND	5.7
Zinc	ug/l	2000	1170	1100	463	221	1480	885
Zinc - dissolved	ug/l	2000	26	ND	ND	19.8	4.6	ND
Cyanide	ug/l	200	ND	21	ND	ND	ND	ND
Cyanide - dissolved	ug/l	200	ND	ND	ND	ND	ND	ND

Notes:
1. Shaded, Boldface Values Exceed NYS Standard or Guidance Values for Class GA Groundwaters - TOGS 1.1.1 June 1998.

TABLE 1-8
SUMMARY OF PARAMETERS DETECTED
LEY CREEK SEDIMENT SAMPLES
NYSDEC (1996-1997)

LOCATION		Sediment	Site Specific	L-6		L-7		L-8		L-107		L-108		L-109		L-110	
VOCs	Units	Criteria[2]	Standard[3]														
2-Butanone	ug/kg	-		65		ND		ND		ND		78		NA		NA	
Acetone	ug/kg	-		190		65	J	ND		18		240		NA		NA	
Benzene	ug/kg	0.6	24.1	ND		ND		ND		ND		3	J	NA		NA	
Carbon disulfide	ug/kg	-		13	J	ND		9	J	2	J	18	J	NA		NA	
Chloromethane	ug/kg	-		ND		ND		ND		ND		10	J	NA		NA	
Cyclotetrasiloxane	ug/kg	-		48	JN	ND		ND		ND		ND		NA		NA	
Vinyl chloride	ug/kg	0.07	2.81	ND		ND		ND		**3**	J	ND		NA		NA	
Methylene chloride	ug/kg	-		ND		ND		ND		4	JB	ND		NA		NA	
1,2-Dichloroethene	ug/kg	0.02	0.80	ND		ND		ND		**8**	J	ND		NA		NA	
Xylene (total)	ug/kg	-		ND		ND		ND		3	J	31		NA		NA	
Ethylbenzene	ug/kg	-		ND		ND		ND		4	J	ND		NA		NA	
SVOCs																	
1,4-Dichlorobenzene	ug/kg	12	482	ND		67	J	ND		ND		160	J	NA		NA	
1,2-Dichlorobenzene	ug/kg	12	482	ND		ND		ND		440		450	J	NA		NA	
2-Methylnaphthalene	ug/kg	-		ND		97	J	ND		140	J	670	J	NA		NA	
4-Methylphenol	ug/kg	-		ND		62	J	ND		ND		ND		NA		NA	
Bis(2-ethylhexyl)phthalate	ug/kg	199.5	8020	2700	JD	830		ND		ND		7500	BD	NA		NA	
Carbazole	ug/kg	-		610	JD	260	J	58	J	900		320	J	NA		NA	
Acenaphthene	ug/kg	140	5628	400	JD	190	J	ND		680	JD	960		NA		NA	
Acenaphthylene	ug/kg	-		540	JD	280	J	150	J	600	JD	2300		NA		NA	
Anthracene	ug/kg	-		1400	JD	580		140	J	2200		1900		NA		NA	
Benzo(a)anthracene	ug/kg	140	5628	4100	D	1890		610		**7200**	D	5300		NA		NA	
Benzo(a)pyrene	ug/kg	1.3	52.3	**3900**	D	**1890**		**600**		**6900**	D	**4800**		NA		NA	
Benzo(b)fluoranthene	ug/kg	140	5628	4200	D	2320		520		**7800**	D	**9200**	D	NA		NA	
Benzo(g,h,i)perylene	ug/kg	-		2300	JD	1310		420	J	1900		2000		NA		NA	
Benzo(k)fluoranthene	ug/kg	140	5628	3600	D	1890		620		ND		ND		NA		NA	
Chrysene	ug/kg	140	5628	5000	D	2470		640		**8800**	D	**12000**	D	NA		NA	
Dibenzofuran	ug/kg	-		ND		110	J	ND		440		970		NA		NA	
Dibenz(a,h)anthracene	ug/kg	-		ND		ND		93	J	ND		430	J	NA		NA	
Fluoranthene	ug/kg	1020	41004	8500	D	3200		890		16000	D	16000	D	NA		NA	
Fluorene	ug/kg	-		760	JD	300	J	67	J	1100		2600		NA		NA	
Indeno(1,2,3-cd)pyrene	ug/kg	140	5628	2400	JD	1340		400	J	2100		2000		NA		NA	
Naphthalene	ug/kg	-		ND		132	J	ND		140	J	640	J	NA		NA	
Phenanthrene	ug/kg	120	4824	**5500**	D	1740		360	J	**8900**	D	3300		NA		NA	
Pyrene	ug/kg	-		8300	D	3920		1300		13000	D	21000	D	NA		NA	
2-Pentanone-4-Hydroxy-4 Met	ug/kg	-		36000		ND		ND		ND		ND		NA		NA	
Pesticides/PCBs																	
Aroclor 1016	ug/kg	0.0008	0.032	**64**	X	**5810**	X	**51**	X	ND		**230000**	DP	ND		ND	
Aroclor 1242	ug/kg	0.0008	0.032	**6300**	D	**36300**	D	**19**	J	ND		ND		ND		ND	
Aroclor 1248	ug/kg	0.0008	0.032	ND		ND		ND		**8000**	D	ND		**6700**	D	**360000**	D
Aroclor 1254	ug/kg	0.0008	0.032	**2100**	JD	**2900**	JD	**19**	J	ND		ND		ND		ND	
Aroclor 1260	ug/kg	0.0008	0.032	**640**		**1130**	JD	**35**	J	**310**		**7400**	JD	**230**	P	**13000**	JD
Metals																	
Aluminum	mg/kg	-		5340		5540	*	9150		3440		12800		NA		NA	
Antimony	mg/kg	2		1.5	BJ	1.7	BJN			ND		**27.6**	N	NA		NA	
Arsenic	mg/kg	6		5.5		4.6		5.2		ND		**20.5**		NA		NA	
Barium	mg/kg	-		92.6		86.7		47.1	B	61.2		257		NA		NA	
Beryllium	mg/kg	-		0.37	B	0.38	B	0.49	B	0.3	B	0.97	B	NA		NA	
Cadmium	mg/kg	0.6		**2.4**		**2.5**		0.39	B	ND		**5.7**		NA		NA	
Calcium	mg/kg	-		58300		43900		11200		188000		57800		NA		NA	
Chromium	mg/kg	26		**146**		**164**		16.7		**138**		**6290**		NA		NA	
Cobalt	mg/kg	-		6.8	B	5.8	B	7.8	B	3.1	B	10.5	B	NA		NA	
Copper	mg/kg	16		**128**	NJ*	**104**	N*J	**28.3**	N*J	**223**		**1170**		NA		NA	
Cyanide	mg/kg	-		1.6		ND		NA		ND		9.1		NA		NA	
Iron	mg/kg	2,000,000		14400	*	13000	*	18700	*	9480		22000		NA		NA	
Lead	mg/kg	31		**122**		**122**		29.1		**123**		**514**		NA		NA	
Magnesium	mg/kg	460		**11400**		**9940**		**5100**		**27600**		**13900**		NA		NA	
Maganese	mg/kg	-		267		246		180		360		284	N	NA		NA	
Mercury	mg/kg	0.15		**0.2**	NJ	**0.17**	NJ	0.11	BNJ	ND		**0.52**		NA		NA	
Nickel	mg/kg	16		**54.1**		**52.6**		13.6		**38**		**1460**		NA		NA	
Potassium	mg/kg	-		991	B	1020	B	2040		730	B	2360		NA		NA	
Selenium	mg/kg			0.66	B	ND		NA		ND		ND		NA		NA	
Silver	mg/kg	1		**1.2**	B	**1.4**	B	**1.3**	B	ND		**6.2**		NA		NA	
Sodium	mg/kg	-		341	B	330	B	171	B	206	B	364	B	NA		NA	
Thallium	mg/kg			NA		NA		0.6	B	ND		1.8	B	NA		NA	
Vanadium	mg/kg	-		17.4	B	17	B	18.9		12.4	B	42.3		NA		NA	
Zinc	mg/kg	120		**294**	NR	ND		NA		**381**		**817**		NA		NA	
Total Organic Carbon	mg/kg									40200		126000					

Notes:

1. Shaded, Boldface Values Exceed Guidance Values determined according to the NYSDEC's Technical Guidance for Screening Contaminated Sediments 1998.
2. Values shown for VOCs, SVOCs, Pesticides, and PCBs have units of ug/g-oc (oc=organic carbon). Values shown for metals have units of mg/kg and are based on lowest effect level.
3. Site-Specific Standards for organic compounds have units of ug/kg and were calculated using sediment criteria for protection of human health and site-specific organic carbon content of 40200 mg/kg. If no criteria existed for protection of human health, next most stringent criteria used.

PCBs, Dibenzofurans, and metals. The results are summarized in Table 1-1. For the groundwater sample from SW-1, the concentrations of benzene, xylenes, iron, magnesium, manganese, and sodium exceed current standards. For the subsurface soil samples from SW-2 and SW-3, acetone, several SVOCs, and several metals (cadmium, chromium, copper, iron, nickel, and zinc) were detected in excess of soil cleanup guidelines outlined in NYSDEC TAGM 4046. PCBs were also detected above the guidance value (10,000 μg/kg) in soil samples collected from boring SW-2 from 5-7 feet bgs (1,100 μg/kg) and from 7-10 feet bgs (270,000 μg/kg). The soil sample collected from 7-10 feet bgs from boring SW-2 also contained mercury (0.8 mg/kg) in excess of the guidance value (0.1 mg/kg).

In 1991, the NYSDEC contracted with Ecology & Environment Engineering, P.C. (E&E) to perform a Preliminary Site Assessment of the Salina Landfill (E&E, 1992). At that time, the site was noted to be grass covered and to contain a perched wetland in the middle area of the landfill. Protruding waste and debris was noticed in some locations and a leachate outbreak on the bank of Ley Creek was observed. No sampling was conducted as part of this assessment.

In 1993, the NYSDEC contracted with E&E to perform another Preliminary Site Assessment of the landfill (E&E, 1994). In this investigation, E& E collected 10 surface water and 10 sediment samples (SW/SED-1 through SW/SED-8, SW/SED-11, and SW/SED-12), 5 surface soil samples (SS-1 through SS-5), and 3 leachate samples (L-1, L-2, and L-3). Results from this sampling effort are summarized in Tables 1-2 through 1-5, respectively. Low concentrations of several chlorinated organic compounds were detected in surface water and sediment samples from Ley Creek and adjacent drainageways. PCBs were also detected in 8 of the 10 sediment samples collected from Ley Creek and adjacent drainageways. The majority of these sediment samples also had elevated concentrations of arsenic, chromium, lead, nickel and zinc. In the surface soil samples, sample SS-1 contained a very high concentration of aroclor 1248 and a number of heavy metals. These data are important because SS-1 was intended to be a background sample. Sample SS-1 is located near the Old Ley Creek Channel site, which the NYSDEC classified as a separate Class 2 inactive hazardous waste site in 1999. The location of this sample has probably been impacted from flooding of Ley Creek or from dredge spoils from the creek that were placed in this area. Lower concentrations of PCBs were also detected in other surface soil samples, but these concentrations are below recommended cleanup standards. The leachate samples collected from the north bank of Ley Creek show that 1,2-dichloroethane, benzene, chlorobenzene, and PCBs are all present in excess of groundwater standards. Two of the leachate samples also contained elevated concentrations of chromium, iron, lead, magnesium, manganese and sodium. No groundwater sampling was conducted as part of this assessment. Based on these results, the report included a recommendation to reclassify the site as a Class 2 site.

TABLE 1-1
TOWN OF SALINA LANDFILL
SUMMARY OF PARAMETERS DETECTED IN GROUNDWATER AND SUBSURFACE SOIL
NYSDEC (1987)

ORIGINAL LOCATION		NY Std.[1]	SW-1		NY Std.[2]	SW-1	SW-1	SW-2	SW-2		SW-2		SW-3		SW-3	
CURRENT DESIGNATION			MW-0			MW-0	MW-0	None	None		None		None		None	
SAMPLE MATRIX			grndwtr			subsoil	subsoil	subsoil	subsoil		subsoil		subsoil		subsoil	
SAMPLE DEPTH			-			2-4'	5.5-7.5'	2-4'	5-7'		7-10'		2-4'		10-12'	
VOCs	**UNITS**	ug/l	ug/l		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg		ug/kg		ug/kg		ug/kg	
Methylene chloride		*5*	ND		*100*	NA	NA	NA	NA		ND		NA		ND	
Acetone		*50*	ND		*200*	NA	NA	NA	NA		**1600**		NA		**700**	
2-butanone		-	ND		*300*	NA	NA	NA	NA		290		NA		150	
Chlorobenzene		*5*	2.2	J	*1700*	NA	NA	NA	NA		58		NA		7.2	J
Ethylbenzene		*5*	1	J	*5500*	NA	NA	NA	NA		NA		NA		ND	
Toluene		*5*	ND		*1500*	NA	NA	NA	NA		31		NA		ND	
Xylenes (total)		*5*	**9.2**		*1200*	NA	NA	NA	NA		30		NA		32	
Benzene		*1*	**2**	J	*60*	NA	NA	NA	NA		NA		NA		ND	
SVOCs	**UNITS**	ug/l	ug/l		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg		ug/kg		ug/kg		ug/kg	
1,4- dichlorobenzene		*3*	2.4	J	*8500*	NA	ND	NA	ND		1300	J	ND		ND	
Naphthalene		*10*	3.7	J	*13000*	NA	ND	NA	ND		1200	J	ND		ND	
Bis (2-ethylhexyl)phthalate		*5*	ND		*50000*	NA	6200	NA	21000		21000		8500		23000	
Di-n-butylphthalate		-	ND		*8100*	NA	ND	NA	ND		1000	J	ND		**79000**	
Di-n-octyphthalate		*50*	ND		*50000*	NA	ND	NA	ND		690	J	650	J	ND	
2-methynaphthalene		-	ND		*36400*	NA	ND	NA	ND		1400	J	ND		ND	
N-nitrosodiphenyl amine		*50*	41		-	NA	ND	NA	ND		2400	J	ND		ND	
Acenapthene		*20*	ND		*50000*	NA	ND	NA	680	J	1700	J	ND		ND	
Acenaphthylene		-	ND		*41000*	NA	ND	NA	ND		980	J	ND		ND	
Anthracene		*50*	ND		*50000*	NA	ND	NA	1700	J	3700	J	890	J	ND	
Benzo(a)anthracene		*0.002*	ND		*224*	NA	ND	NA	**2200**	J	**4600**	J	**1500**	J	ND	
Benzo(a)pyrene		*ND*	ND		*61*	NA	ND	NA	**2100**	J	**5400**	J	**1500**	J	ND	
Benzo(b)fluoranthene		*0.002*	ND		*1100*	NA	ND	NA	**2800**	DJ	**8200**	J	**2300**	DJ	ND	
Benzo(g,h,i)perylene		-	ND		*50000*	NA	ND	NA	1200	J	3200	J	1200	J	ND	
Benzo(k)fluoranthene		*0.002*	ND		*1100*	NA	ND	NA	**2800**	DJ	**8200**	J	**2300**	DJ	ND	
Butylbenzylphthalate		*50*	ND		*50000*	NA	ND	NA	NA		NA		1600	J	ND	
Chrysene		*0.002*	ND		*400*	NA	ND	NA	**2100**	J	**7500**		**1700**	J	ND	
Dibenzofuran		-	ND		*6200*	NA	ND	NA	500	J	1200	J	ND		ND	
Dibenz(a,h)anthracene		-	ND		*14*	NA	ND	NA	**470**	J	**1100**	J	**460**	J	ND	
Indeno(1,2,3-cd)pyrene		*0.002*	ND		*3200*	NA	ND	NA	1100	J	**3300**	J	1200	J	ND	
Fluoranthene		*50*	ND		*50000*	NA	ND	NA	**4500**		**12000**		**3100**	J	ND	
Fluorene		*50*	ND		*50000*	NA	ND	NA	1100	J	2800	J	ND		ND	
Phenanthrene		*50*	ND		*50000*	NA	ND	NA	3400	J	13000		2100	J	ND	
Pyrene		*4.6*	ND		*50000*	NA	ND	NA	3800	J	13000		2900	J	ND	
Pesticides/PCBs	**UNITS**	ug/l	ug/l		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg		ug/kg		ug/kg		ug/kg	
Aroclor-1242		*0.09*	ND		*10000*	NA	ND	NA	**11000**		**270000**		ND		4900	
Dibenzofurans	**UNITS**					ng/g	ng/g	ng/g	ng/g		ng/g		ng/g		ng/g	
Tetra			NA			ND	NA	0.029	NA		0.018		NA		0.029	
Penta			NA			ND	NA	ND	NA		0.054		NA		ND	
Hexa			NA			ND	NA	0.17	NA		0.054		NA		ND	
Hepta			NA			ND	NA	0.31	NA		0.098		NA		ND	
Octa			NA			ND	NA	0.14	NA		0.17		NA		ND	
Metals	**UNITS**	ug/l	ug/l		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg	
Aluminum		-	9930		*SB*	NA	NA	NA	NA		7940		NA		5570	
Arsenic		*25*	ND		*7.5*	NA	NA	NA	NA		13		NA		ND	
Barium		*1000*	165		*300*	NA	NA	NA	NA		163		NA		140	
Cadmium		*5*	ND		*1*	NA	NA	NA	NA		**29**		NA		**11**	
Calcium		-	408000		*SB*	NA	NA	NA	NA		51300		NA		28200	
Chromium		*50*	18		*10*	NA	NA	NA	NA		**4060**		NA		**430**	
Copper		*200*	28		*25*	NA	NA	NA	NA		**1420**		NA		**674**	
Iron		*300*	**15900**		*2000*	NA	NA	NA	NA		**44200**		NA		**91200**	
Lead		*25*	14		*SB*	NA	NA	NA	NA		378		NA		180	
Magnesium		*35000*	**132000**		*SB*	NA	NA	NA	NA		12600		NA		8650	
Maganese		*300*	**473**		*SB*	NA	NA	NA	NA		430		NA		749	
Mercury		*0.7*	ND		*0.1*	NA	NA	NA	NA		**0.8**		NA		0.6	
Nickel		*100*	29		*13*	NA	NA	NA	NA		**1490**		NA		**541**	
Potassium		-	4650		*SB*	NA	NA	NA	NA		822		NA		685	
Silver		*50*	ND		*SB*	NA	NA	NA	NA		24		NA		ND	
Sodium		*20,000*	**93700**		*SB*	NA	NA	NA	NA		ND		NA		ND	
Tin		-	ND		-	NA	NA	NA	NA		137		NA		116	
Vanadium		-	21		*150*	NA	NA	NA	NA		26		NA		15	
Zinc		*2000*	134		*20*	NA	NA	NA	NA		**1010**		NA		**1560**	

Notes:
1. Shaded, Boldface Values Exceed NYS Standard or Guidance Value for Class GA Groundwater - TOGS 1.1.1 June 1998
2. Shaded, Boldface Values Exceed NYS Recommended Soil Cleanup Guidance Value - TAGM 4046

TABLE 1-4
TOWN OF SALINA LANDFILL
SUMMARY OF PARAMETERS DETECTED IN SURFACE SOIL
ECOLOGY AND ENVIRONMENT (1994)

LOCATION		Eastern USA Background[2]	NY-Std.[3]	SS-1	SS-2	SS-3	SS-4	SS-5
VOCs	**Units**							
Acetone	ug/kg	-	200	ND	ND	ND	12 J	ND
SVOCs								
Total PAHs	ug/kg	-	-	51000 J	4800	7300 J	NA	1300 J
Carbazole	ug/kg	-	-	620 J	40 J	100 J	NA	ND
Dibenzofuran	ug/kg	-	6200	170 J	ND	52 J	NA	ND
Pesticides								
4,4'-DDE	ug/kg	-	2100	ND	ND	4.5 J	ND	ND
Dieldrin	ug/kg	-	44	ND	ND	ND	ND	4.7 J
4,4'-DDT	ug/kg	-	2100	ND	ND	ND	ND	28
PCBs								
Aroclor-1248	ug/kg	-	1000	**30000** JDC	59	36 J	680 J	ND
Aroclor-1254	ug/kg	-	1000	ND	23 J	16 J	280 J	ND
Metals								
Aluminum	mg/kg	33,000	SB	3200	4160	1900	NA	3410
Arsenic	mg/kg	3-12	7.5 or SB	**15.4**	6.1	3	NA	3.2
Barium	mg/kg	15-600	300 or SB	172	68.8	38.6	NA	66.2
Beryllium	mg/kg	0-1.75	0.16 or SB	**0.7**	**0.36**	ND	NA	**0.23**
Cadmium	mg/kg	0.1-1	1 or SB	**6.9**	ND	ND	NA	ND
Calcium	mg/kg	130-35,000	SB	47400	81500	67400	NA	211000
Chromium	mg/kg	1.5-40	10 or SB	**1920**	**14.2**	7	NA	**13.9**
Cobalt	mg/kg	2.5-60	30 or SB	9.8	7.1	5.3	NA	5
Copper	mg/kg	1-50	25 or SB	**485**	18.7	20.4	NA	21.2
Iron	mg/kg	2000-550,000	2000 or SB	**10400**	**9600**	**5470**	NA	**8940**
Lead	mg/kg	4-500	SB	330	27.2	25.2	NA	26.3
Magnesium	mg/kg	100-5,000	SB	9160	21400	12500	NA	22800
Manganese	mg/kg	50-5,000	SB	197	319	262	NA	254
Mercury	mg/kg	0.001-0.2	0.1	**0.4**	ND	ND	NA	ND
Nickel	mg/kg	0.5-25	13 or SB	**484**	12.6	8.6	NA	12.7
Potassium	mg/kg	8,500-43,000	SB	338	615	261	NA	ND
Selenium	mg/kg	0.1-3.9	2 or SB	0.82	ND	ND	NA	0.35
Silver	mg/kg	-	SB	4	ND	ND	NA	ND
Sodium	mg/kg	6,000-8,000	SB	627	255	98.4	NA	ND
Thallium	mg/kg	-	SB	0.42	0.25	ND	NA	ND
Vanadium	mg/kg	1-300	150 or SB	25.7	20.4	5.9	NA	13.3
Zinc	mg/kg	9-50	20 or SB	**481**	**40.5**	**36.2**	NA	**62.9**
Cyanide	mg/kg	-	-	2.6	0.7	ND	NA	ND

Notes:
1. Shaded, Boldface Values Exceed NYS Recommended Soil Cleanup Guideline - TAGM 4046.
2. Eastern USA Background values per TAGM 4046.
3. SB = Site Background.

TABLE 1-5
TOWN OF SALINA LANDFILL
SUMMARY OF PARAMETERS DETECTED IN LEACHATE
ECOLOGY AND ENVIRONMENT (1994)

LOCATION		NY Std.	L-1		L-2		L-3	
VOCs	**Units**							
1,2-Dichloroethane	ug/l	0.6	**7**	J	ND		ND	
Benzene	ug/l	1	**3**	J	**4**	J	**4**	J
Chlorobenzene	ug/l	5	**27**		**20**		**20**	
SVOCs								
1,2-Dichlorobenzene	ug/l	3	3	J	ND		NA	
1,4-Dichlorobenzene	ug/l	3	2	J	2	J	NA	
PCBs								
Aroclor-1232	ug/l	0.09	ND	J	**2.6**		**2.5**	J
Metals								
Aluminum	ug/l	-	5830		4030		NA	
Arsenic	ug/l	25	1.5		3.1		NA	
Barium	ug/l	1000	982		697		NA	
Calcium	ug/l	-	232000		227000		NA	
Chromium	ug/l	50	**203**		**124**		NA	
Cobalt	ug/l	-	37.7		19.3		NA	
Copper	ug/l	200	168		116		NA	
Iron	ug/l	300	**153000**		**72700**		NA	
Lead	ug/l	25	**71**		**63.9**		NA	
Magnesium	ug/l	35000	**57000**		**56500**		NA	
Manganese	ug/l	300	**671**		**485**		NA	
Mercury	ug/l	0.7	0.32		ND		NA	
Nickel	ug/l	100	**116**		53.4		NA	
Potassium	ug/l	-	33000		38300		NA	
Sodium	ug/l	20000	**53700**		**56900**		NA	
Vanadium	ug/l	-	25.4		16.5		NA	
Zinc	ug/l	2000	284		201		NA	
Total Hardness	mg/l		814		800		NA	

Notes:
1. Shaded, Boldface Values Exceed NYS Standard or Guidance Value for Class GA groundwater - TOGS 1.1.1 June 1998.

In 1995, the NYSDEC again contracted with E&E to perform a Preliminary Site Assessment Addendum of the Salina Landfill (E&E, 1996). This report summarized supplementary work at the subject site to better define the site stratigraphy, to evaluate whether a release to groundwater has occurred, and to determine the direction of groundwater flow. Tasks completed included geophysical surveying, installing five groundwater monitoring wells (MW-1 through MW-5), and drilling two borings (BH-1 and BH-2). Subsurface soil samples were collected from each of the borings for the monitoring wells. No soil samples were collected from borings BH-1 and BH-2. Groundwater samples were collected from each of the newly installed monitoring wells, as well as, the existing monitoring well MW-0. In addition, two surface water and sediment samples (SW/SED2-1 and SW/SED2-2) were collected and analyzed by NYSDEC.

The results of subsurface soil sampling are summarized in Table 1-6. Two of the soil samples contained elevated levels of total xylenes and 1,2-dichloroethene. A number of samples also contained PCBs, but in concentrations below recommended cleanup standards. The results of the groundwater sampling effort are summarized in Table 1-7. Of the five groundwater wells sampled, wells MW-1, MW-2, and MW-3 contained 6 volatile organic compounds in excess of groundwater quality standards. Well MW-0 was considered to be an upgradient well and generally was free from organic contaminants. Wells MW-4 and MW-5 also showed little evidence of organic contaminants, with the exception of 1.1 μg/l of aroclor 1242 in well MW-5. All wells contained metals in excess of standards. Of particular concern were the concentrations of arsenic, barium, copper, iron, lead, magnesium, manganese, nickel, and sodium. Surface water and sediment samples SW/SED2-1 and SW/SED2-2 were analyzed for PCBs. Aroclor 1254 was detected in sediment samples SED2-1 and SED2-2 at 440 μg/kg and 580 μg/kg, respectively. No other PCBs were detected in the sediment samples and no PCBs were detected in either of the surface water samples.

In 1996 and 1997, the NYSDEC collected seven sediment samples from the Old Ley Creek channel (L-6 through L-8 and L-107 through L-110). Results from this sampling effort are summarized in Table 1-8. It should be noted that these are <u>sediment</u> samples, not <u>leachate</u> samples, despite the nomenclature (i.e., samples L-1, L-2, and L-3 collected by E&E in 1993 were leachate samples, whereas L-6 through L-8 and L-107 through L-110 are sediment samples). Also, note that sample location L-8 is not depicted in Figure 1-4; the exact location of this sample could not be determined based on available information. The results indicated that all of the samples contained PAHs with concentrations of benzo(a)pyrene, chrysene, and phenanthrene above sediment criteria. All samples also contained PCBs in excess of sediment criteria. The samples also contained a number of heavy metals including cadmium, chromium, copper, lead, nickel, and zinc in excess of sediment criteria. Note that the sediment criteria used

TABLE 1-6
TOWN OF SALINA LANDFILL
SUMMARY OF PARAMETERS DETECTED IN SUBSURFACE SOIL
ECOLOGY AND ENVIRONMENT (1996)

LOCATION		**NY Std.**	**MW1-001**	**MW1-002**	**MW2-001**	**MW3-001**	**MW4-001**	**MW5-001**
VOCs	**Units**							
Vinyl Chloride	ug/kg	200	ND	ND	ND	71 J	ND	ND
Carbon Disulfide	ug/kg	2700	31 J	ND	11 J	ND	ND	2 J
Total 1,2 Dichloroethene	ug/kg	300	ND	ND	ND	**1300**	ND	ND
2-Butanone	ug/kg	300	ND	14	ND	ND	ND	53
Toluene	ug/kg	1500	210	3 J	3 J	ND	ND	ND
Ethylbenzene	ug/kg	5500	1400 J	16	9 J	ND	ND	ND
Total xylenes	ug/kg	1200	**9600** J	120	14 J	ND	ND	ND
Pesticides/PCBs								
Dieldrin	ug/kg	10	ND	ND	ND	**12**	ND	ND
Aroclor 1242	ug/kg	10000	640	860	ND	890 J	630	2700

Notes:
1. Shaded, Boldface Values Exceed NYS Recommended Soil Cleanup Objective - TAGM 4046

were those for the protection of human health as listed in the NYSDEC document, "Technical Guidance for Screening Contaminated Sediments" (NYSDEC 1999) . If a criterion for this level of protection for a particular analyte does not exist, the next most stringent criterion was used. Old Ley Creek was designated a Class 2 inactive hazardous waste site in 1999.

It is also important to note that other investigations have been conducted near the Salina Landfill site. In 1998, O'Brien & Gere Engineers (OB&G, 1999) conducted sampling for General Motors Corporation (GM) in Ley Creek upgradient of the site. The results of this report confirm that the GM Facility discharged volatile and semi-volatile organic compounds, PCBs and priority pollutant metals into Ley Creek. This facility is located two miles up-gradient from the Salina landfill.

2.0 STUDY AREA INVESTIGATION

This section of the report describes the investigations that have been conducted for this project. Two phases of field investigations were performed. The Phase I field investigation was conducted between June 29 and September 30, 1998. The primary elements of this investigation consisted of:

- a topographic survey
- an ecological survey
- a waste area investigation
- a subsurface investigation
- a multi-media sampling program (surface water, sediment, leachate, surface soil, subsurface soil, and groundwater)

A Phase II investigation was conducted in August 1999. This investigation consisted of:

- additional soil and groundwater sampling
- a limited additional waste area investigation
- a limited additional ecological survey

Both phases of investigation will be described in further detail below.

2.1 TOPOGRAPHIC SURVEY

A comprehensive field survey was performed to develop a site-wide topographic base map in order to establish a standardized site plan upon which all site features and sampling locations could be plotted. The survey was conducted using current conventional total station and data collector techniques. The survey control references the New York State Plane Coordinate System, Central Zone, NAD 83. Ground surface elevations were measured at numerous locations across the site, and specifically at breaks in slope and at significant surface features (e.g., manholes, streams, etc.). The elevation data was then contoured using Softdesk® software at 1-foot intervals. These elevations reported reference to NGVD 1988. The datum described above was introduced to the site by GPS techniques, using Trimble® Geodetic receivers.

The survey did not include the formal delineation of property lines, but our survey crews did stake out the approximate limits of property owned by Onondaga County so that we could locate an abandoned sanitary sewer in the field. CHA obtained record data to map the location of underground utilities including a natural gas pipeline installed and maintained by Buckeye Pipeline, an active sanitary sewer installed and maintained by Onondaga County Department of Drainage and Sanitation (OCDDS), and an abandoned sanitary sewer installed by Onondaga County in the 1930s. CHA has also mapped the location of another natural gas pipeline installed and maintained by Niagara Mohawk, based on the location of numerous gas markers along its path across the site. CHA survey crews performed their initial fieldwork between June 22, 1998 and July 3, 1998.

In the Phase I Investigation, CHA retained Modi Engineering and Land Surveying, P.C. to survey the location and elevation of all sampling points within the site boundary, including groundwater monitoring wells, piezometers, test pits, surface soil samples, leachate samples, and surface water and sediment samples. The elevation of all sampling points was determined to the nearest 0.01-foot. In the Phase II Investigation, CHA's survey crews surveyed the location of all test locations.

Note that the location of two surface water and sediment samples (SW/SED-20 and SW/SED-24) and two borings (B-21 and B-22) were not surveyed. The above-mentioned surface water and sediment samples were beyond the limits of the site base map. The above-mentioned borings were drilled in the middle of Ley Creek and could not easily be staked out for later survey. In all cases, the locations of the points have been added to appropriate figures based on their approximate location referenced to easily identifiable landmarks (e.g, bridges, utility poles, etc.).

The resulting base map is presented as Plate 1. Note that most of the figures within the report show topography at a 5-foot interval for clarity and convenience.

2.2 ECOLOGICAL SURVEY

The goals of the ecological survey for the Town of Salina Landfill site include: (1) documenting the ecological condition of the site, (2) documenting whether actual or potential exposure pathways and ecological receptors exist at the site, and (3) gathering data to be used in evaluating remedial alternatives.

The field surveys were used to help compile the site description and provide information on:

- Fish and wildlife resources present on or adjacent to the site;

- Habitats (terrestrial and aquatic) present on or adjacent to the site;
- Fish and wildlife expected to utilize habitats present on and adjacent to the site;
- Qualitative observations of stress, if observed, and a semi-qualitative assessment of aquatic stress.

2.2.1 Literature review

Agency consultations and file search results were requested and received from the following agencies:

- United States Fish and Wildlife Service – Threatened and Endangered Species (TES) and agency consultation with Mr. Mark W. Clough, Cortland, NY.
- New York State Natural Heritage Program - TES and Significant Habitats agency file search by Ms. Teresa Mackey, Latham, NY.
- New York State Department of Environmental Conservation, Endangered Species Unit - Tentative NY Amphibian and Reptile Atlas Program Results provided by Ms. Kim Hunsinger, Delmar, NY.

Information provided by the U.S. Fish and Wildlife Service (USFWS), in a letter from Mark W. Clough, dated June 19, 1998 (Appendix A-1), indicated that no Federally listed or proposed threatened or endangered species (TES) under their jurisdiction are known to exist within a 2-mile radius of the site. USFWS also stated that no biological assessment or further Section 7 consultation under the Endangered Species Act (ESA) is required because the area is not known to contain any Federally listed species. USFWS has indicated that no further consultation with that agency is required for this project.

The NYSDEC Natural Heritage Program (NHP), in a letter from Teresa Mackey dated June 19, 1998 (Appendix A-1), provided information on TES, sensitive habitats, and breeding birds within 2 miles of the site. Their information indicates that there are no known TES, although three confirmed breeders (upland sandpiper, grasshopper sparrow, and common nighthawk) were listed as species of special concern that may occur on or immediately adjacent to the site if suitable habitat were available. Species of special concern are species for which a concern or risk of endangerment has been documented by NYSDEC and USFWS. A more quantitative delineation of habitat or inventory would be implemented in the event of: (1) a state and/or Federally listed rare, threatened, or endangered species or a species of special concern is observed or determined to be present on the site or in the survey area; (2) areas of the site are identified/determined to be potential significant habitat (major breeding, wintering, or feeding/nursery areas); or (3) an economically important species is observed on the site or in the survey area and areas of the site are determined to be critical habitat (major feeding, breeding, or wintering area) for these populations.

The three State-listed special concern species – common nighthawk, grasshopper sparrow, and upland sandpiper – are discussed in detail in Appendix A-2, since the habitat found on and immediately adjacent to the Town of Salina could support these species. All three were confirmed breeders in the vicinity of the project site, but the exact locations and numbers (pairs/nests) have not been provided. These species will be targeted if additional studies are required to determine their status on the landfill and potential impacts of remedial actions on local populations.

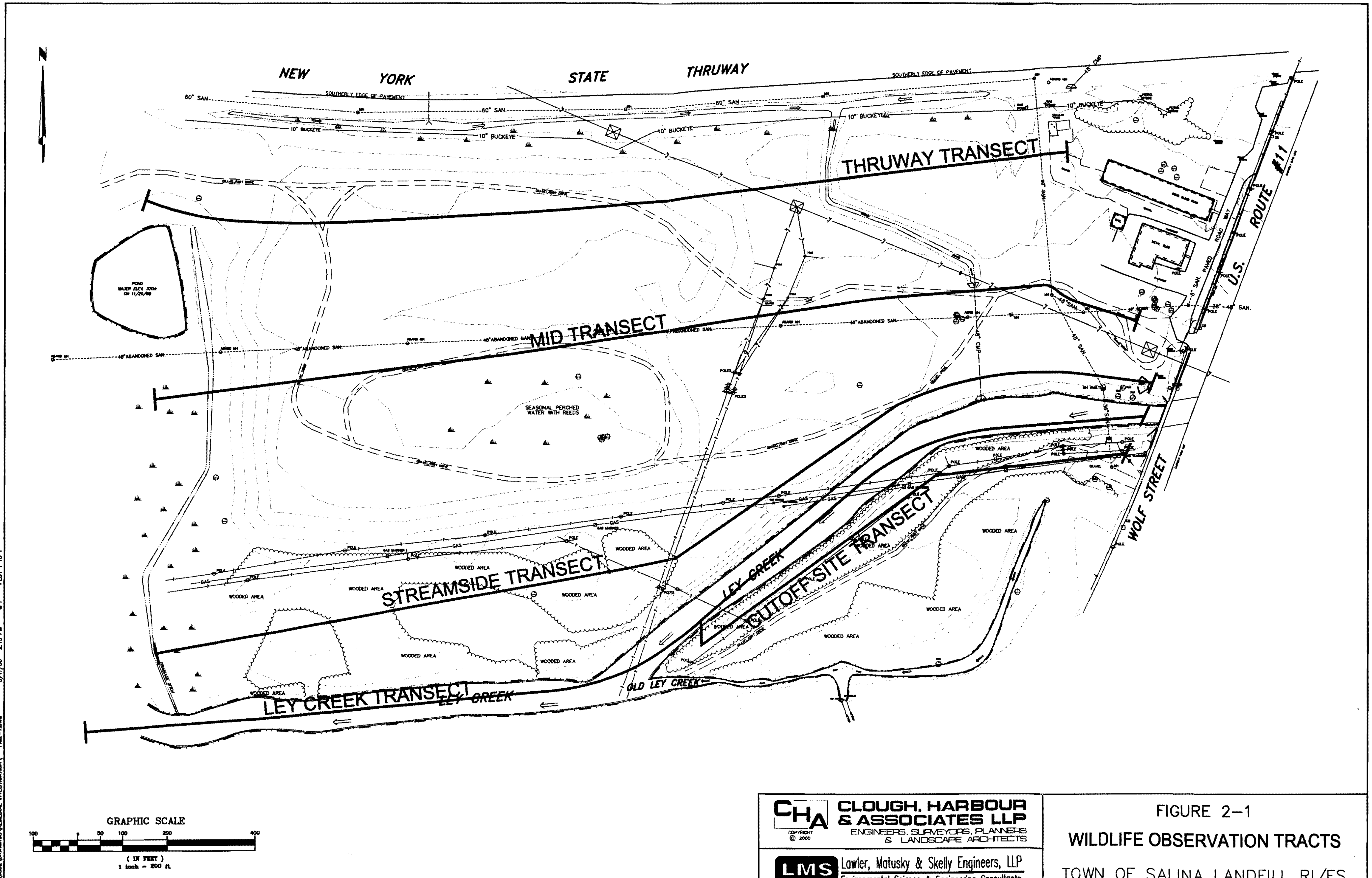
A list of amphibians and reptiles known to exist in Onondaga County, New York was provided by Kim Hunsinger of NYSDEC's Endangered Species Unit and was received on June 10, 1998 (Appendix A-2). No further information regarding which of these species is expected to utilize the site was provided.

In addition to the agency contacts discussed above, an electronic literature search was conducted to locate literature appropriate for the project and the ecological risk assessment. Searches for information on potential ecological receptors, contaminants of potential concern (COPCs), and studies similar to the current study were conducted. Pertinent information identified was obtained through inter-library loan, or was purchased. Literature and maps, including topographic wetlands maps, aerial photographs, and land use maps, were used to produce site maps of ecological communities, topography, and drainage. Information on the values of ecological communities to fish and wildlife and the value of these resources to humans was obtained from the literature and applied to the site.

2.2.2 Wildlife, Fish, and Macroinvertebrate Surveys

2.2.2.1 Wildlife Survey

Wildlife surveys were conducted by LMS from July 22-24, 1998 along five transects (Figure 2-1). A three-day wildlife survey of birds, mammals, reptiles and amphibians was conducted. Wildlife species, numbers, and locations were recorded along three transects that ran parallel to



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Environmental Science & Engineering Consultants

FIGURE 2–1

WILDLIFE OBSERVATION TRACTS

TOWN OF SALINA LANDFILL RI/FS

Ley Creek on the north side and one transect on the south side of Ley Creek. Ley Creek was canoed as a fifth transect. This method allowed a relatively large area to be sampled in a short time and was an effective way of comparing abundance in different habitat types. This method provides information on the number of individuals and species observed along each transect.

Birds were identified through direct observation, song or call, nests, or their remains, and their numbers were recorded. Mammals were identified through direct observation, burrows, tracks, scat, or remains. Reptiles and amphibians were identified through observation or other evidence of their presence, including calls of frogs and toads, presence of eggs and larvae of amphibians, and nests, eggs, and tracks of reptiles. For mammals, reptiles and amphibians, some of the debris along transects were turned. Aquatic habitats were examined for adult and larval amphibians and other aquatic wildlife.

Incidental observations included wildlife observations made during other site work that did not coincide with the transect surveys.

2.2.2.2 Fish Survey

A fish survey of Ley Creek was conducted in the vicinity of the Salina Landfill at the same time as the wildlife survey (July 1998). Three informal observations/collections were made at the site by dipnet and backpack electrofisher. A Smith Root Type VII backpack electrofisher with a pulsed DC current of 0.5 to 1 amp was used to minimize mortality or injury to fish. Sampling was conducted at three stations: one upstream, one adjacent to, and one downstream of the landfill (Figure 2-2).

Electrofishing periods lasted approximately 10 to 20 minutes and depended on the number of fish collected. All fish collected were held in live tanks until they were identified and enumerated and lengths (total length [TL]) of the smallest fish, the largest fish, and the fish most representative of the collection were taken to the nearest millimeter. Water temperature, conductivity, dissolved oxygen, and pH were recorded at each sampling area. These water quality sampling locations are illustrated in Figure 2-3.

2.2.2.3 Macroinvertebrate Survey

Samples for macroinvertebrates were taken in July 1998 with a ponar grab sampler rather than with a kick sampler because of the compacted smooth bottom, slow flow (less than 0.5 fps), and deep water (2.5 to 3 ft.). Samples were collected at four locations (Figure 2-3). Replicate samples were washed and preserved in the field after screening through a 500-micron mesh

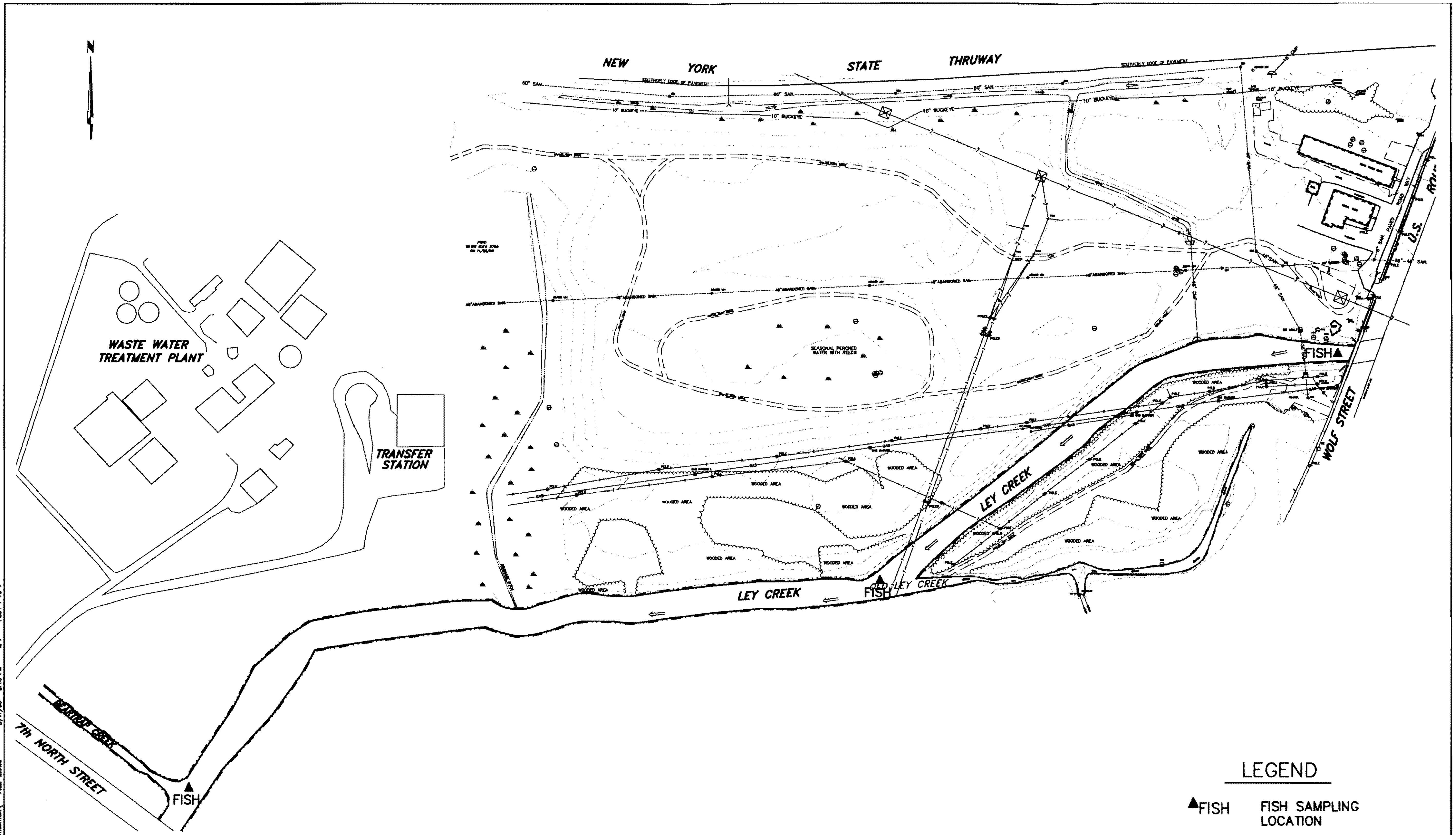

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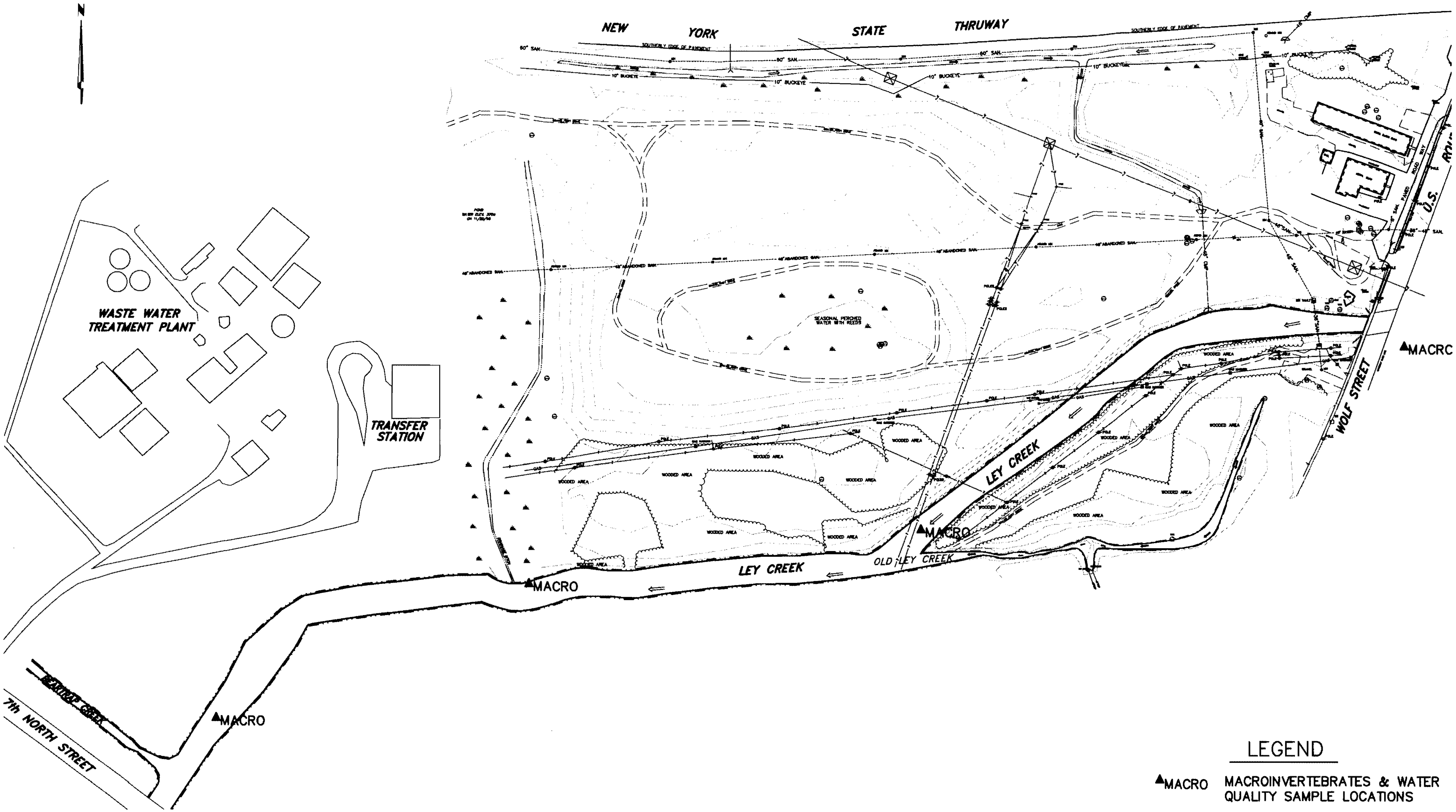
FIGURE 2-2
FISH SAMPLING LOCATIONS
TOWN OF SALINA LANDFILL RI/FS



GRAPHIC SCALE

125 0 67.5 125 250 500

(IN FEET)
1 inch = 250 ft.

LEGEND

▲MACRO MACROINVERTEBRATES & WATER QUALITY SAMPLE LOCATIONS

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FIGURE 2–3
MACROINVERTEBRATES AND WATER QUALITY SAMPLING LOCATIONS
TOWN OF SALINA LANDFILL RI/FS

sieve. Samples were returned to the LMS laboratory, logged in, and stored for future analysis. One of the upstream replicates was analyzed, and one replicate from each of the other three stations was examined and compared to the one upstream sample.

2.2.3 Covertype and Wetland Surveys

NYSDEC regulates wetlands 12.4 acres and larger unless noted otherwise (6NYCRR Part 608). The U.S. Army Corps of Engineers (USACE) also regulates wetlands of all sizes. The New York State regulations for protection of waters (6NYCRR Part 608) also applies to Ley Creek and is administered by the NYSDEC. Actual wetland delineation and permitting for activities under the NYSDEC and USACE would be completed at a later stage of this project (Remedial Design) and are therefore not further discussed in this report.

2.2.3.1 Habitat Survey

Vegetation associations and habitats (including streams and wetlands) were identified based on descriptions provided in the NYSDEC publication "Ecological Communities of New York State" (Reschke 1990). The habitat survey was conducted during three days in July 1998. Dominant plant species in each stratum (i.e., overstory, understory, shrub layer, and ground cover) were identified along with species that contribute to the area food supply (browse, nuts, seeds, and berries). Species dominance was based on the estimated percent aerial coverage of each species in each vegetative layer or group, such as the canopy, understory, shrub/sapling layer, and ground cover. The locations of habitats were placed on site base maps.

Flora in the survey area and vegetation adjacent to the site were evaluated based on opportunistic observations made from area roadways and accessible public and private land.

The cover type of the land area within 0.8 km (0.5 miles) of the site was documented from aerial photographs, land use maps, soil conservation maps, and state and Federal wetlands maps. The cover type maps were opportunistically ground-truthed. Habitat types were noted and this information was transferred to the site maps.

2.2.3.2 Wetland Verification

On-site wetlands were verified (using hydrology, vegetation, and soil parameters), described, and located on site base maps showing their approximate extent. The wetland survey was conducted during July 1998 with the habitat survey. Since the investigation was only at the RI stage, no formal delineation of wetlands was conducted.

2.3 WASTE AREA INVESTIGATION

There were several objectives to the waste area investigation. The objectives included:

- delineation of the limit of waste disposal at the site
- determination of the thickness of waste
- identification of the type of waste with special interest on potentially hazardous waste
- determination of the extent and thickness of soil cover over the waste
- determination of current methane gas migration
- evaluation of a former sanitary sewer as a contaminant migration pathway

The investigation included: 1) a review of historical records; 2) the excavation of test pits at the apparent periphery of the landfill and along the abandoned sewer; 3) the advancement of borings through the waste mass; and 4) the performance of a soil gas survey. Together, the information gathered from these subtasks was used to define the subsurface configuration of the waste mass, its contents, and potential contaminant sources.

2.3.1 Historical Record Review

Prior to conducting any fieldwork, CHA reviewed historical aerial photographs and the design plans for a sanitary sewer that crosses through the landfill.

Historical aerial photographs of the site were obtained from the Onondaga County Health Department. Stereoscopic pairs of photographs taken in 1951, 1959, 1964, 1967, 1972, 1981, and 1985 were reviewed and interpreted to understand the development of the landfill over time. Copies of these photographs are included in Appendix B-1.

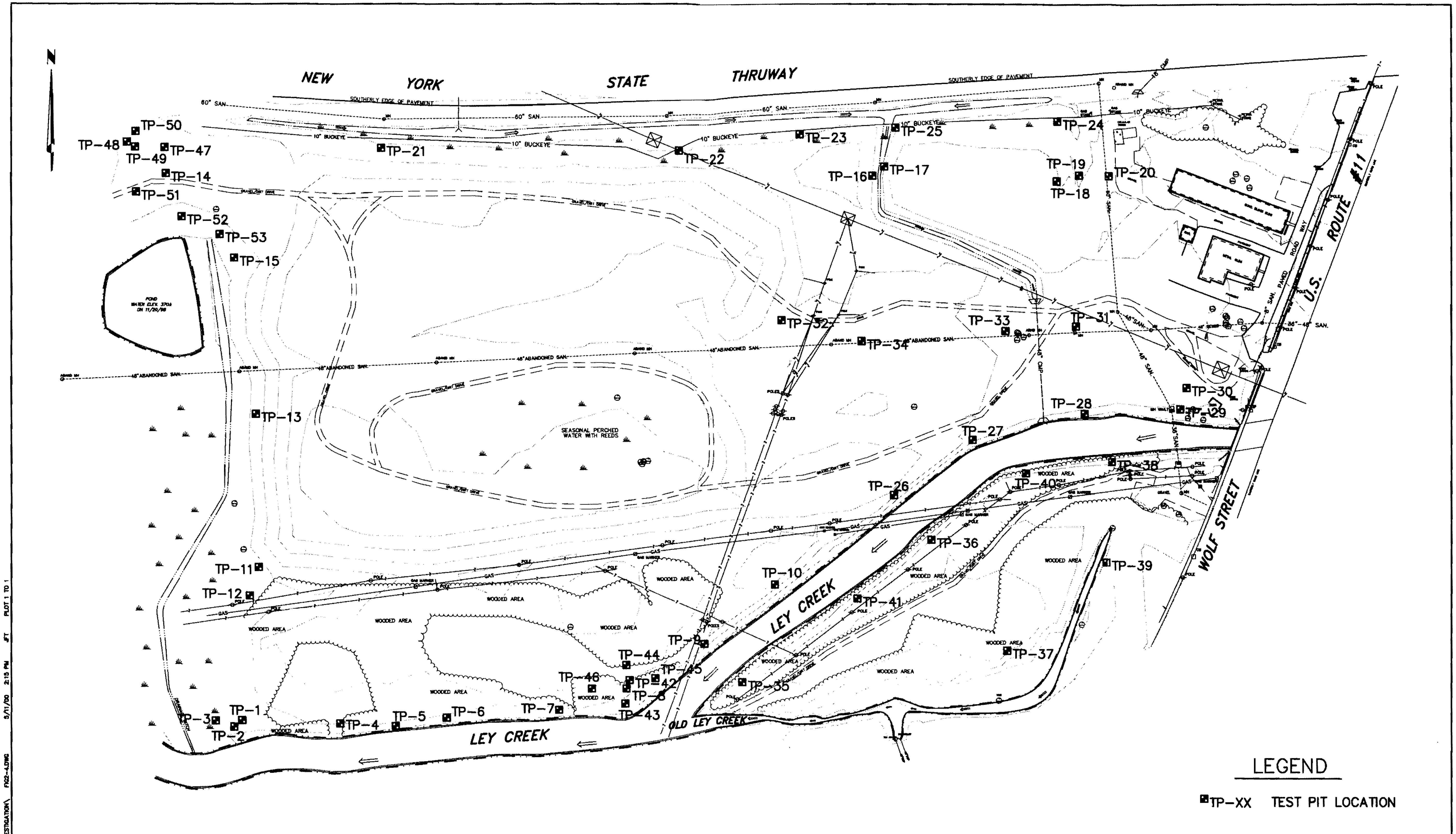
Engineering drawings for a section of sanitary sewer located between the Ley Creek Sewage Treatment Plant and Route 11 were obtained from the Onondaga County Drainage and Sanitation Department. The original plans were dated 1934. The plans show that the sanitary sewer is oriented in an east-west direction and crosses the site about midway between the New York State Thruway and Ley Creek. The plans depict the topography of the original land surface in the vicinity of the landfill and show the subsurface stratigraphy along the sewer line, based on boring logs from a number of shallow borings. That sewer was abandoned sometime in the 1980s and a new sewer was routed around the northern and eastern boundaries of the landfill. It is unknown how the old sewer was abandoned.

2.3.2 Test Pit Excavation

In the Phase I Investigation, excavation activities were conducted between August 5 and August 11, 1998 using a track excavator operated by American Auger & Ditching Company of Constantia, New York. A total of 37 test pits were excavated to determine the limit of waste. A total of 4 test pits were excavated to investigate the sewer line.

In the Phase II investigation, excavation activities were conducted between August 10 and August 20, 1999 using a track excavator operated by Parratt Wolff, Inc. A total of 13 test pits were excavated.

During excavation of the test pits, a CHA geologist or engineer directed the work and kept logs of the materials encountered in each test pit (Appendix B-2). In many of the test pits, the excavation continued until the limit of waste was encountered and the pits became long trenches. CHA staff marked the limit of waste with a wooden stake. The locations of all test pits excavated in both phases of investigation were located by survey and are depicted in Figure 2-4.
A sanitary sewer line, installed in the 1930s, was known to cross beneath the center of the site. To determine if bedding material around the sewer line created a preferred pathway for contaminant transport in the subsurface, CHA excavated 4 test pits along the sewer line (TP-31, TP-32, TP-33, and TP-34). The sewer line was located in only 2 of the 4 test pits excavated, TP-31 and TP-33. The test pits were excavated on the eastern end of the site. It was not possible to search for the sewer in the western end of the site because the thickness of the waste mass was greater than the reach on the excavation equipment available.



GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 200 ft.

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FIGURE 2-4

TEST PIT LOCATIONS

TOWN OF SALINA LANDFILL RI/FS

2.3.3 Soil Borings

In the Phase I Investigation, four soil borings were drilled on the site to determine the thickness of the waste in the landfill, and to help understand the subsurface stratigraphy on the site (discussed further in Section 2.4). The borings were designated B-10, B-11, B-12 and B-13. The borings were drilled by American Auger & Ditching Company under the supervision of a CHA geologist. The work was conducted between July 9 and July 21, 1998. These borings were drilled using a hollow-stem auger drilling rig. Two-inch diameter split spoon samples were collected continuously from surface grade until refusal. The split spoon sampler was advanced by dropping a 140-pound hammer a height of 30 inches. The final depth of the deep borings was determined in the field, based on the type of material encountered and its compactness. After the borings were completed, they were grouted back to the surface to minimize any cross-contamination between aquifers.

In the Phase II Investigation, an additional four soil borings were drilled and four Shelby Tubes were collected by Parratt Wolff, Inc. This work was conducted between August 19-23, 1999. Two soil borings were drilled in the middle of Ley Creek to determine if waste was present beneath the bed of the Creek. These borings were designated B-21 and B-22 and were drilled. using a tripod rig set on a barge. A six-inch diameter steel casing was driven into the creek bottom to prevent surface water from entering the borehole. Similar to the borings drilled in the Phase I Investigation, these borings were advanced until refusal.

An additional two borings, designated B-23 and B-24, were drilled immediately adjacent to monitoring well MW-10. The groundwater sample from well MW-10 contained the highest concentration of contaminants on site. To determine the feasibility of performing bioremediation on the soil around MW-10 to improve groundwater quality, ,three split spoon samples were obtained from each boring and were analyzed for total metals, ammonia, nitrate, total kjeldahl nitrogen and standard plate count. These parameters were selected to evaluate natural bacterial activity and nitrogen levels, as well as potential inhibitors to bioremediation (e.g., high arsenic concentrations). Additionally, grain size analysis was performed on the deepest sample from each boring (24-26 ft below ground surface in B-23 and 22-24 ft below ground surface in B-24).

In addition to these four borings, Shelby tubes were collected at four locations on site. The tubes were designated NE-Shelby, NW-Shelby, SW-Shelby, and SE-Shelby in reference to their relative position on site. The purpose of collecting the Shelby tubes was to determine the permeability of the soil cap that was placed over the landfill in the early 1980s. The tubes were advanced from ground surface to a depth of 2 feet below grade. At the time of collection, the surface soil was very dry and very hard making collection of the Shelby tubes difficult. Only 2 of the 4 tubes were suitable for testing. These tubes were analyzed for hydraulic conductivity using Flexible Wall ASTM D5804.

The location of all borings drilled during both phases of investigation is depicted in Figure 2-5. The geotechnical soil data (grain size analysis and permeability) are included in Appendix B-3. The boring logs for all of the borings drilled are included in Appendix B-4.

2.3.4 Soil Gas Survey

The objective of this task was to determine if the landfill is still producing methane gas and determine whether gas is migrating off site. CHA performed a soil gas survey on August 11-12, 1998. Using a two-man crew, the survey was performed by advancing a steel probe approximately 3-4 feet into the ground and then using a meter designed to detect methane gas (Scott D-15) to analyze the soil gas in the hole made by the probe. The survey points were located around the perimeter of the landfill at approximately 100-foot intervals. Survey points were also located across the top of the landfill at 200-foot intervals (Figure 2-6). Survey data are included in Appendix B-5.

2.4 GROUNDWATER INVESTIGATION

2.4.1 Well Installation and Development

Six groundwater monitoring wells had been installed around the perimeter of the landfill during previous investigations (MW-0, MW-1, MW-2, MW-3, MW-4 and MW-5). Because of the size of the landfill, to more fully characterize the nature of groundwater flow and associated contaminant transport beneath and in the immediate vicinity of the landfill, a more detailed assessment of groundwater flow conditions was necessary. Of particular importance to this investigation was the interaction between groundwater and surface water in Ley Creek. Additionally, there was no available information on groundwater quality on the portion of the site between the old Ley Creek channel and the new Ley Creek channel. Finally, there was no information on the presence or absence of contamination in deeper aquifers on site. Using American Auger and Ditching Co., CHA installed an additional eight (8) shallow wells and three (3) deep wells on the site (Figure 2-5). The wells were installed between June 29, 1998 and August 12, 1998.

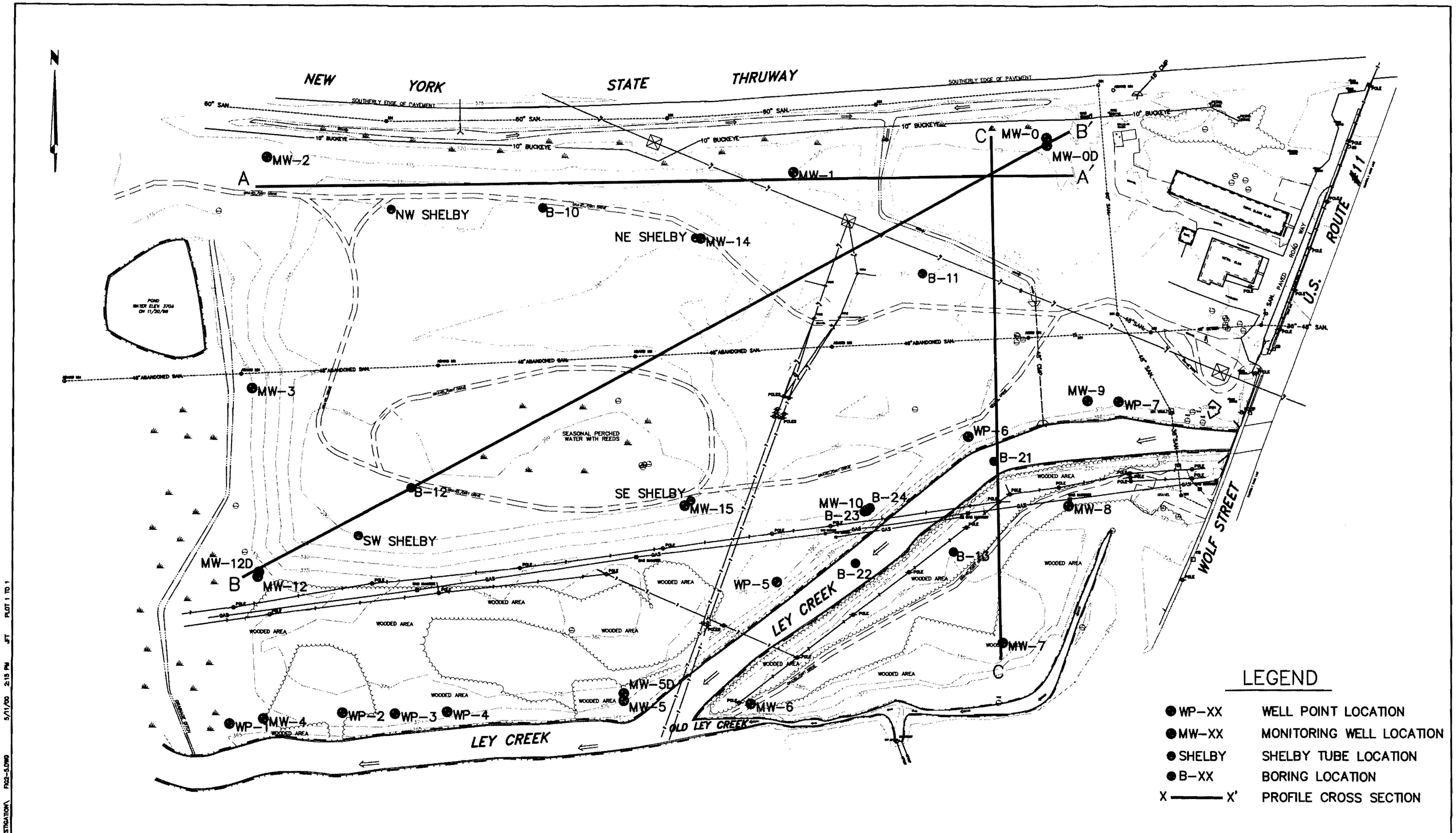

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FIGURE 2–5
MONITORING WELL, WELL POINT AND BORING LOCATIONS
TOWN OF SALINA LANDFILL RI/FS

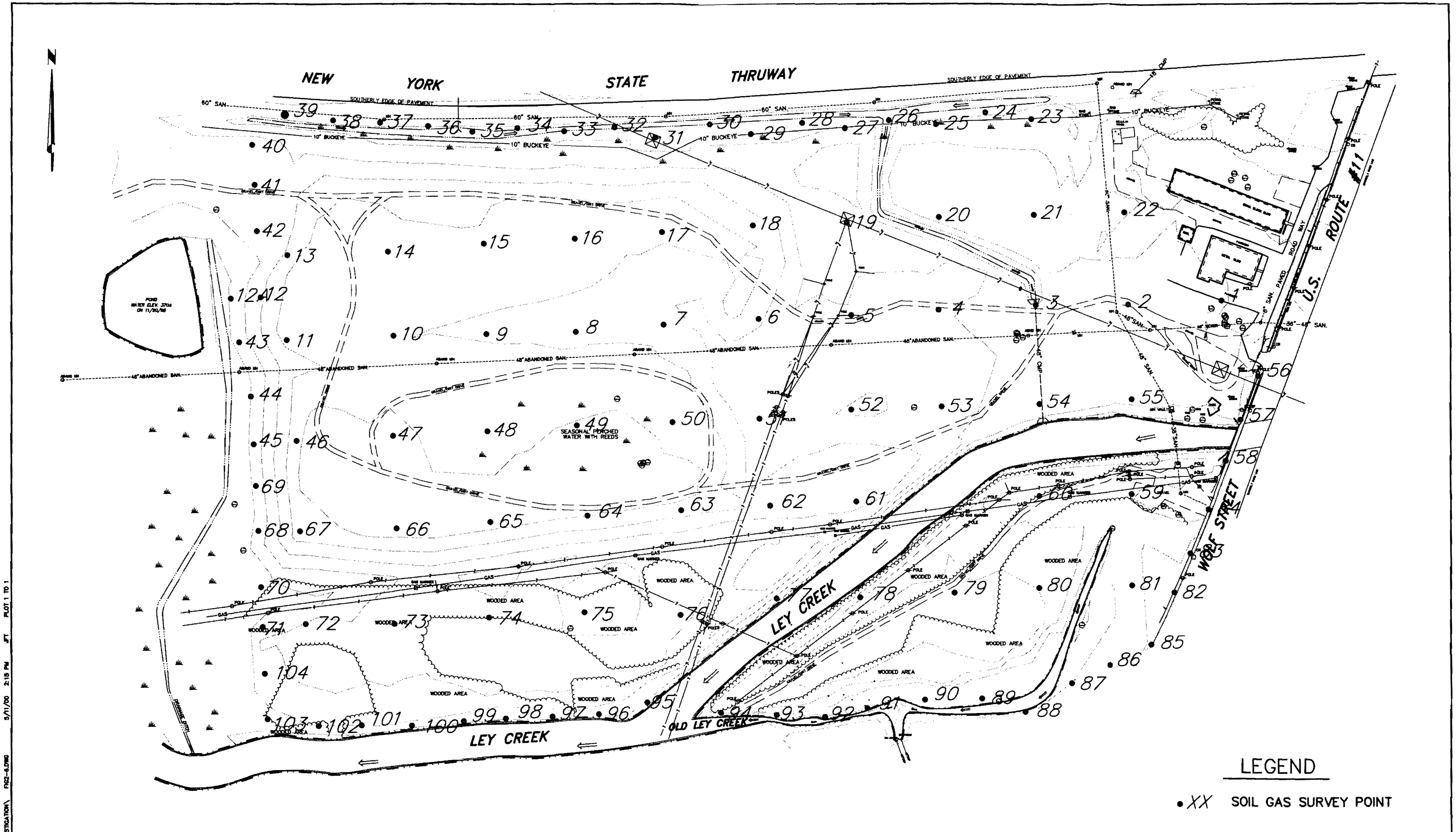

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FIGURE 2–6

SOIL GAS SURVEY POINTS

TOWN OF SALINA LANDFILL RI/FS

The shallow wells (MW-6, MW-7, MW-8, MW-9, MW-10, MW-12, MW-14, and MW-15) were installed using 4.25-inch diameter hollow stem augers to depths ranging from 16 to 30 feet below grade. The soil was continuously sampled from ground surface to the bottom of each boring using a split spoon sampler. Groundwater was encountered in each of the shallow borings, with depths ranging from 4 to 18 feet below grade.

The wells were constructed of two-inch diameter PVC with 0.010 slot PVC screens set at depth intervals to intersect the water table. Sand packs were installed around the well screens, extending approximately two feet above the top of the screens. A two-foot thick bentonite clay seal were placed above each sand pack, and the remaining annulus of each borehole was backfilled with bentonite-cement grout to the surface. A steel protective casing was installed in a concrete pad at the surface around each well riser.

Three deep monitoring wells (MW-OD, MW-5D, and MW-12D) were installed in strategic locations around the landfill. The wells were installed adjacent to existing or newly drilled shallow wells. The deeper monitoring wells were installed in two stages. Based upon the information on the subsurface stratigraphy obtained during the drilling of the initial 4 borings (previously described in Section 2.3.3), CHA had learned that a coarse-grained unit greater than 20 feet in thickness existed beneath a 10 to 20 foot thick layer of low permeability silt and clay. Six-inch diameter steel casing was driven several feet into this silt and clay unit and grouted in place. Drilling then continued approximately 20 feet into the coarse-grained unit. Two-inch diameter monitoring wells were then installed using the same procedures described above for the shallow monitoring wells. Of note, well MW-12D is a free-flowing artesian well. To prevent groundwater from continually discharging from this well, an inflatable packer was placed into the well to block the flow of water.

During drilling of all wells, a CHA geologist or engineer logged the subsurface materials encountered. Boring logs and monitoring well construction diagrams for each of the new wells are provided in Appendix B-4.

In addition to these eleven permanent wells, to better understand the interaction between groundwater and the production of leachate seeps observed along the north bank of Ley Creek, CHA also installed seven temporary well points designated WP-1 through WP-7. The location of these well points is also shown on Figure 2-5. The temporary wells were constructed by drilling approximately 5-7 feet into the water table and installing two-inch slotted PVC into each borehole. The screened portion of the PVC was surrounded by filter pack material. The annular space between the top of the screen and land surface was backfilled with drill cuttings; then a bentonite seal was placed around the well at land surface to prevent infiltration of surface water along the well casing. A PVC slip cap was placed over the top of the well casing. These well points do not have locking caps.

The newly installed permanent monitoring wells and temporary wells were developed using a submersible pump for up to four hours, or until pumped groundwater turbidity was less than 50 NTUs. The 50 NTU turbidity goal was achieved at four of the eleven wells. The seven remaining wells did not recover sufficiently during development. Pumped well water was discharged to the ground surface adjacent to the well from which it was pumped. Well development logs are provided in Appendix B-6.

2.4.2 Groundwater Flow Characterization

As part of the characterization of groundwater flow at the site, hydraulic conductivity values for representative saturated media were measured. Hydraulic conductivity testing was performed on June 1 and 3, 1998 on the newly installed groundwater monitoring wells, with the exception of well MW-12D which could not be tested because of its free-flowing condition. Both falling head and rising head tests were performed on each well, and in some cases, multiple tests were performed. The tests were performed using a submerged pressure transducer and data logging devise. The wells tested were selected as representative of the various overburden materials encountered during the drilling of soil borings. Data collected during the field tests was processed using AQTESOLV software. The software input parameters and computer-generated results are presented in Appendix B-7.

To determine groundwater flow direction, water levels in all monitoring wells were measured on three occasions; on August 13, August 28, and October 28, 1998. By subtracting the depth to water in each well from the surveyed elevation of the top of the well, groundwater elevations were calculated. Groundwater piezometric maps were then constructed by contouring the groundwater elevation data (see Section 3).

2.5 MULTI-MEDIA SAMPLING

To characterize the nature and extent of contamination, representative samples of surface soil, subsurface soil, surface water, sediment, groundwater, and leachate were collected and submitted for laboratory analysis. Table 2-1 lists all samples collected and the analyses performed on these samples in both phases of investigation.

TABLE 2-1
TOWN OF SALINA LANDFILL
SAMPLING SUMMARY

Sample ID	Date Collected	Lab ID	Sample Analyses																	
			VOCs	SVOCs	Pest/PCB	Total Metals	Dissolved Metals	CN	Sulfide	Sulfate	Ammonia	Nitrate	TOC	TKN	Chloride	Phenols	Alkalinity	Hardness	Turbidity	Dioxin Isomers
Surface Soil Sampling																				
SS-10	8/19/98	A8343301	●	●	●	●		●												
SS-11	8/19/98	A8343302	●	●	●	●		●												
SS-12	8/19/98	A8343303	●	●	●	●		●												
SS-13	8/19/98	A8343304	●	●	●	●		●												
SS-14	8/19/98	A8343305	●	●	●	●		●												
SS-15	8/19/98	A8343306	●	●	●	●		●												
SS-16	8/19/98	A8343307	●	●	●	●		●												
SS-20	8/24/99	23799001		●	●	●		●												
SS-21	8/24/99	23799002		●	●	●		●												
SS-22	8/24/99	23799003		●	●	●		●												
SS-23	8/24/99	23799004		●	●	●		●												
SS-24	8/24/99	23799005		●	●	●		●												
SS-25	8/24/99	23799006		●	●	●		●												
SS-26	8/24/99	23799007		●	●	●		●												
SS-27	8/24/99	23799008		●	●	●		●												
SS-28	8/24/99	23799009		●	●	●		●												
SS-29	8/24/99	23799010		●	●	●		●												
SS-30	8/24/99	23799011		●	●	●		●												
SS-31	8/24/99	23799012		●	●	●		●												
SS-32	8/24/99	23799013		●	●	●		●												
SS-33	8/24/99	23799014		●	●	●		●												
SS-34	8/24/99	23799015		●	●	●		●												
SS-25	8/24/99	23799016		●	●	●		●												
SS-36	8/24/99	23799017		●	●	●		●												
SS-37	8/24/99	23799018		●	●	●		●												
SS-38	8/24/99	23799019		●	●	●		●												
SS-39	8/24/99	23799020		●	●	●		●												
SS-40	8/24/99	23799021		●	●	●		●												
SS-41	8/24/99	23799022		●	●	●		●												
Subsurface Soil Sampling																				
TP-8	8/5/98	A8317201	●	●	●	●		●												
TP-14	8/6/98	A8321101	●	●	●	●		●												
TP-31	8/10/98	A8325301	●	●	●	●		●												
TP-33	8/10/98	A8325302	●	●	●	●		●												
TP-34	8/11/98	A8328601	●	●	●	●		●												
TP-45	8/18/99	23199070	●	●	●	●		●												
TP-46	8/18/99	23199071	●	●	●	●		●												
TP-47	8/18/99	23199072	●	●	●	●		●												
B-23 (0-4')	8/23/99					●					●	●		●						
B-23 (18-20')	8/23/99					●					●	●		●						
B-23 (24-26')	8/23/99					●					●	●		●						
B-24 (0-2')	8/23/99					●					●	●		●						
B-24(18-20')	8/23/99					●					●	●		●						
B-24 (22-24')	8/23/99					●					●	●		●						
Sediment Sampling																				
SED-20	8/26/98	A8356403	●	●	●	●		●					●							
SED-20D	8/26/98	A8356404	●	●	●	●		●					●							
SED-21	8/26/98	A8356405	●	●	●	●		●					●							
SED-21D	8/26/98	A8356406	●	●	●	●		●					●							
SED-22	8/26/98	A8356407	●	●	●	●		●					●							
SED-22D	8/26/98	A8356408	●	●	●	●		●					●							
SED-23	8/27/98	A8359701	●	●	●	●		●					●							
SED-23D	8/27/98	A8359702	●	●	●	●		●					●							
SED-24	8/27/98	A8359703	●	●	●	●		●					●							
SED-24D	8/27/98	A8359704	●	●	●	●		●					●							
SED-25	8/26/98	A8356401	●	●	●	●		●					●							
SED-25D	8/26/98	A8356402	●	●	●	●		●					●							

TABLE 2-1
TOWN OF SALINA LANDFILL
SAMPLING SUMMARY

			Sample Analyses																	
Sample ID	Date Collected	Lab ID	VOCs	SVOCs	Pest/PCB	Total Metals	Dissolved Metals	CN	Sulfide	Sulfate	Ammonia	Nitrate	TOC	TKN	Chloride	Phenols	Alkalinity	Hardness	Turbidity	Dioxin Isomers
Groundwater Sampling																				
MW-0	8/18/98	A8340501	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-0D	8/17/98	A8338501	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-1	8/24/98	A8349801	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-2	8/24/98	A8349804	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-3	8/25/98	A8352701	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-4	8/24/98	A8349806	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-5	8/24/98	A8349805	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-5D	8/20/98	A8346002	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-6	8/18/98	A8340301	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-7	8/19/98	A8343201	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-8	8/18/98	A8340302	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-9	8/18/98	A8340502	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-10	8/24/98	A8349901	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-12	8/25/98	A8352702	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-12D	8/25/98	A8352703	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-14	8/24/98	A8349802	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MW-15	8/21/98	A8348201	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
WP-1	8/21/98	A8348202							●	●	●	●	●	●	●	●	●	●	●	
WP-2	8/20/98	A8346004							●	●	●	●	●	●	●	●	●	●	●	
WP-3	8/20/98	A8346005							●	●	●	●	●	●	●	●	●	●	●	
WP-4	8/20/98	A8346001							●	●	●	●	●	●	●	●	●	●	●	
WP-5	8/19/98	A8342803							●	●	●	●	●	●	●	●	●	●	●	
WP-6	8/19/98	A8342802							●	●	●	●	●	●	●	●	●	●	●	
WP-7	8/19/98	A8342801							●	●	●	●	●	●	●	●	●	●	●	
MW-0	8/17/99	23199073				●														●
MW-10	8/18/99	23099068	●	●	●	●		●												●
Surface Water Sampling																				
SW-20	8/26/98	A8355202	●	●	●	●		●										●		
SW-21	8/26/98	A8355203	●	●	●	●		●										●		
SW-22	8/26/98	A8355204	●	●	●	●		●										●		
SW-23	8/27/98	A8359201	●	●	●	●		●										●		
SW-24	8/27/98	A8359202	●	●	●	●		●										●		
SW-25	8/26/98	A8355201	●	●	●	●		●										●		
Leachate Sampling																				
L-1	9/30/98	A8415902	●	●	●	●		●												
L-2	9/30/98	A8415903	●	●	●	●		●												
L-6	9/30/98	A8415901	●	●	●	●		●												

As the samples were collected, they were placed on ice in a cooler. Sample bottles were packed in a protective material, such as bubble wrap or vermiculite to prevent breakage during shipping. All samples were then listed on a chain-of-custody form. Samples were either shipped to the laboratory using Federal Express or delivered directly to the laboratory, depending upon the laboratory used.

2.5.1 Groundwater Sampling

In the Phase I Investigation, the six existing and eleven newly installed monitoring wells and the seven well points were sampled between August 17 and 25, 1998. All wells were purged and sampled using a Grundfos Rediflo 2 submersible pump with dedicated polyethylene tubing. During purging, the discharge water was monitored for temperature, conductivity, pH, Eh, and turbidity until these parameters stabilized. Groundwater sampling logs documenting these measurements are provided in Appendix B-8. Purge water was discharged directly to the ground surface. After the water quality parameters stabilized, the pumping rate was reduced and samples were collected.

During the Phase I Investigation, the samples from the permanent monitoring wells were submitted for analysis of all parameters on the Target Compound List/Target Analyte List (TCL/TAL), plus cyanide. Specifically, these parameters include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and metals. In addition, the samples were analyzed for dissolved metals and leachate indicator parameters including total dissolved solids (TDS), alkalinity, chloride, sulfate, sulfide, ammonia, total kjeldahl nitrogen (TKN), nitrate, total phenols, total organic carbon (TOC), turbidity, and hardness. The samples collected from the temporary well points were analyzed for leachate indicators only.

During the Phase II Investigation, groundwater samples were collected from only wells MW-0 and MW-10. During the first round of sampling, well MW-10 exhibited the greatest degree of contamination. To determine if the first round results were accurate, this well was sampled again for all TCL/TAL parameters. Additionally, because dioxins have been associated with PCBs, to determine if dioxins were present in the groundwater, this well was sampled for dioxin isomers. To provide data on background conditions, well MW-0 was sampled again and analyzed for total metals and dioxin isomers.

2.5.2 Leachate Sampling

The proposed sampling of leachate included collecting samples from up to six identifiable leachate seeps from the banks of Ley Creek. Three leachate seeps were identified during reconnaissance of the banks of the creek. The leachate samples were collected on September 30, 1998. It was originally intended to collect the leachate samples in late August when the surface water and sediment samples were collected. However, due to heavy rains in late August and early September, water levels in the creek rose to a point where the leachate seeps were under water and not accessible. Therefore, sampling was postponed until water levels had subsided in late September. The leachate samples were designated L-1, L-2 and L-6. Their location is depicted in Figure 2-7. No further seeps were observed upstream (east) of sample location L-2. To collect the samples, a depression was excavated below the seep to allow enough liquid to accumulate. The leachate samples were obtained by dipping a disposable beaker into the pooled leachate. Collected samples were submitted for laboratory analysis of all TCL/TAL parameters and cyanide. No leachate samples were collected during the Phase II Investigation.

2.5.3 Surface Water and Sediment Sampling

In the Phase I Investigation, six surface water and twelve sediment samples were collected. The surface water and sediment samples were collected between August 26 and 27, 1998 from Ley Creek. At each of six locations, one surface water sample and two sediment samples were collected.

Sample set SW/SED-20 was collected upstream of the site and was considered the background sample. It is important to note however that other sources of contamination are known to exist upstream of the site. Sample set SW/SED-21 was collected immediately downstream of the point where a 48-inch diameter corrugated metal pipe (CMP) empties into Ley Creek. Discharge from this CMP comes from a drainageway that collects surface water runoff from the northern and eastern part of the site. Sample set SW/SED-22 was downstream of the confluence of old Ley Creek and the main channel of Ley Creek. Sample set SW/SED-23 was collected downstream of the confluence of a drainageway that collects surface water runoff from the western part of the site and Ley Creek. Sample set SW/SED-24 was collected downstream of the confluence of Bear Trap Creek and Ley Creek approximately 1.2 miles downstream from the western boundary of the site. Sample set SW/SED-25 was collected at the head of the drainageway that drains in a southerly direction toward Ley Creek. The location of the surface water and sediment samples collected is depicted in Figure 2-7.

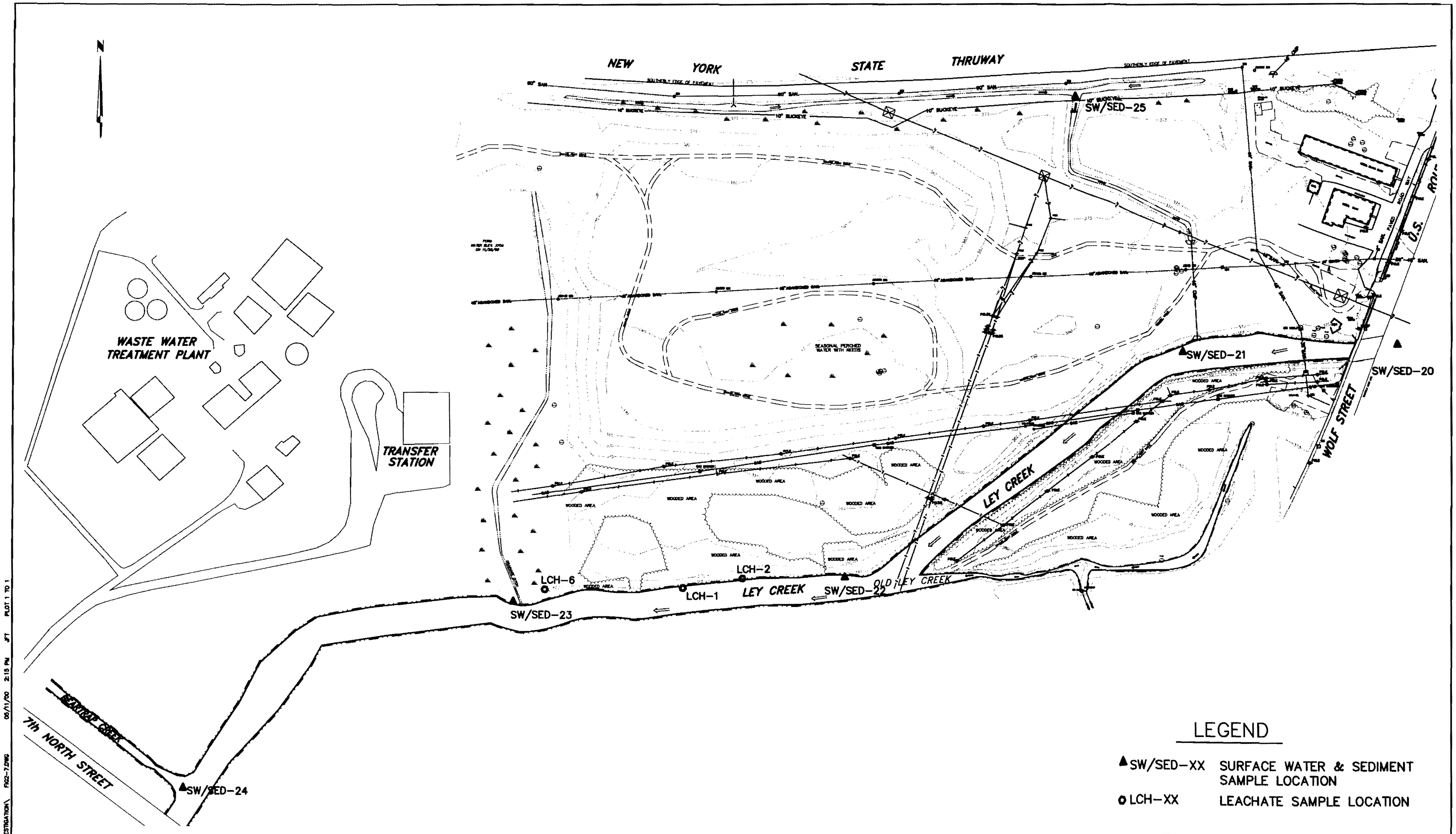

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FIGURE 2-7
SURFACE WATER, SEDIMENT AND LEACHATE SAMPLE LOCATIONS
TOWN OF SALINA LANDFILL RI/FS

The surface water samples were collected off the bank of the creek by dipping disposal plastic beakers directly into the creek and transferring the water into the appropriate sample containers. The sediment samples were collected using a 3.0-inch diameter split spoon sampler. The samples were collected by pushing the sampler into the bottom sediments and then carefully withdrawing the sampler. In most cases, due to poor sample recovery, several attempts were necessary. The sample was emptied directly from the inner tube into the appropriate sample container. At each location, a sediment sample was collected from 0-6 inches below stream bottom and a second sample was collected from 6-12 inches below stream bottom. The deeper of the two sediment samples was designated with a "D" (e.g., SED-20D).

In addition to collecting the surface water and sediment samples, water quality readings of temperature, pH, eH, dissolved oxygen, conductivity and turbidity were measured and recorded at each sampling station. Surface water and sediment sampling logs documenting these measurements are provided in Appendix B-8. Stakes and flagging marking the location of each sampling station were installed for the subsequent location survey.

All surface water and sediment samples were submitted for laboratory analysis of full TCL/TAL parameters and cyanide. Additionally, the surface water samples were analyzed for hardness and the sediment samples were analyzed for total organic carbon. No surface water or sediment samples were collected during the Phase II Investigation.

2.5.4 Surface Soil Sampling

During the first phase of investigation, a total of 7 samples were collected. One of the samples (SS-10) was collected from a location believed to represent background conditions in the northwest corner of the site. It was later learned during the test pit excavation program that waste was located below surface in the vicinity of sample SS-10. The remaining samples were collected over the remainder of the site and were designated SS-11 through SS-16. During the second phase of investigation, an additional 22 samples were collected across the site. Samples SS-40 and SS-41 were designated as background samples. All samples were collected at a depth of approximately 0 to 6 inches below the surface. The location of all surface soil samples collected during both phases of investigation are depicted on Figure 2-8.

The samples were obtained by hand excavation with a shovel after removing surface vegetation. Samples were transferred directly to sample jars from the shovel. Each of the samples collected during the first phase of investigation was submitted for laboratory analysis of all TCL/TAL parameters and cyanide. These samples were collected on August 19, 1998.

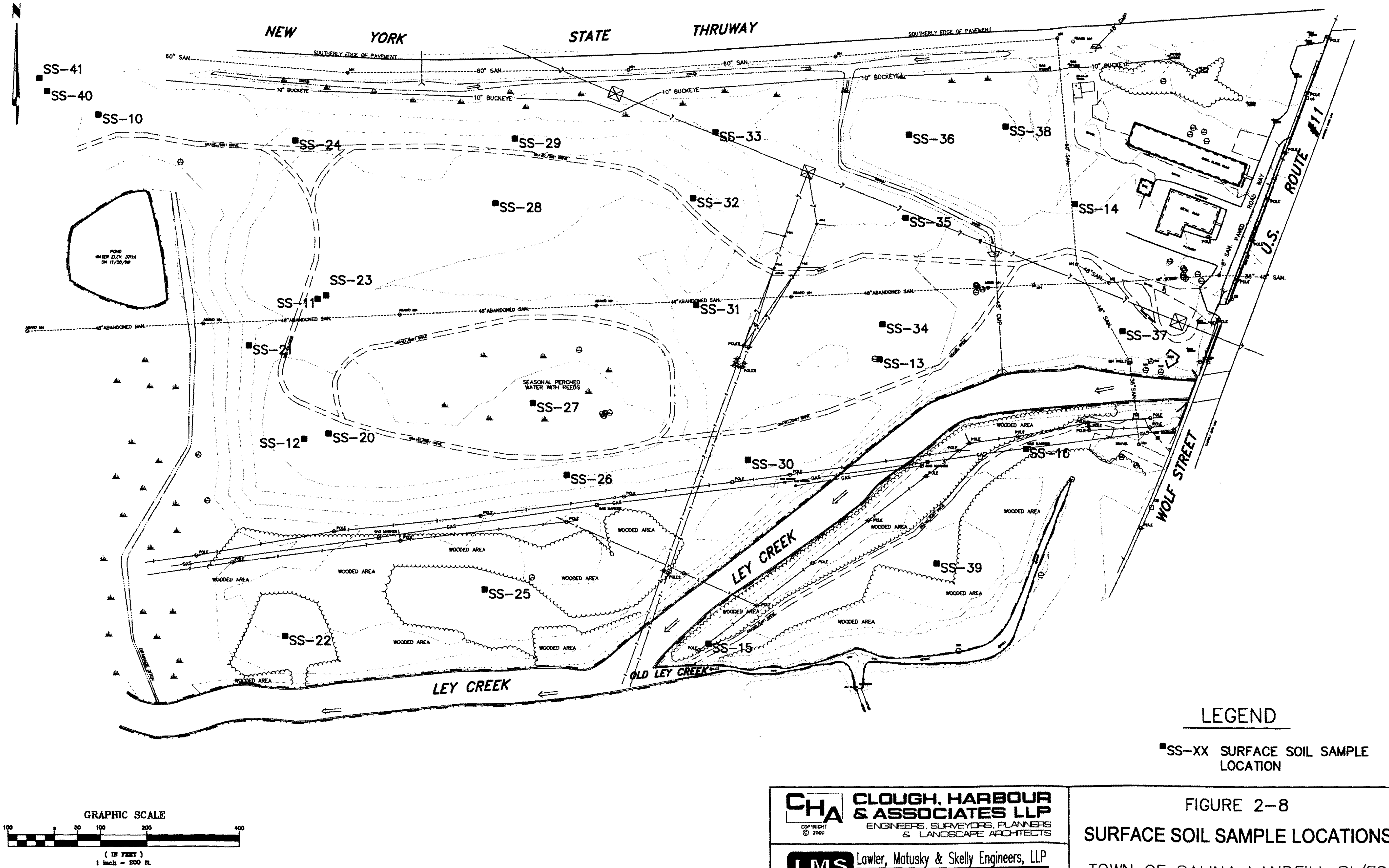

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FIGURE 2-8
SURFACE SOIL SAMPLE LOCATIONS
TOWN OF SALINA LANDFILL RI/FS

The samples collected during the second phase of investigation were analyzed for SVOCs, pesticides, PCBs, metals, and cyanide. Because VOCs were generally absent in the surface soils collected during the first phase of investigation, VOCs were not analyzed during the second round of sampling. These samples were collected on August 24, 1999.

2.5.5 Subsurface Soil Sampling

The project work plan proposed that up to 22 samples of subsurface soil would be collected and submitted to a laboratory for analysis of contaminants. This included one sample from each of 15 borings, with the criteria that the samples be collected from soils lying beneath landfilled materials, but above the water table. This also allowed for the collection and analysis of up to 5 samples of unusual or suspect materials encountered in test trenches and up to 2 samples of bedding material, if encountered, adjacent to the abandoned sanitary sewer line.

During the Phase I Investigation, a total of 5 samples of subsurface materials were collected and analyzed. Samples were collected from test pits TP-8, TP-14, TP-31, TP-33, and TP-34. The sample from TP-8 was collected from a black oily sludge with a strong petroleum odor. The sample from TP-14 was collected from a very compact yellow sandy material, with no odor. The sample from TP-31 was collected from a dark stained soil, near where the original sanitary sewer line connected to the current sewer line (although the original sanitary sewer line was not located in this test pit). The samples from TP-33 and TP-34 were collected from soils in contact with the original sanitary sewer line that crossed the site. No samples were collected from any borings because the soils lying below landfilled materials were always below the water table.

All samples collected were shipped to RECRA Environmental, Inc. for analysis of all TCL/TAL parameters. Based on the results of the sampling conducted during the Phase I Investigation, it was determined that the black oily sludge found in test pit TP-8 contained high concentrations of PCBs (results discussed in detail in Section 4). Therefore, in the Phase II Investigation, a further objective was to further identify the limits of the black oily sludge in the landfill. Three additional samples of subsurface materials were collected during the Phase II Investigation. Samples were collected from test pits TP-45, TP-46, and TP-47. As with the samples collected during the Phase I Investigation, the samples collected and analyzed during the Phase II Investigation were similarly analyzed for all parameters on the TCL/TAL.

The location of all subsurface soil samples collected during both phases of investigation are depicted on Figure 2-4.

2.5.6 Biota Sampling

Earthworm samples were collected from August 18-20, 1999 after a very dry summer. Earthworm sample locations were based on existing and proposed surface soil sampling locations and were determined upon arrival at the site. A total of six locations were sampled for earthworms, all of which were on the main landfill cover north of Ley Creek (Figure 2-9). Prior to selecting an earthworm sampling location, each potential location was checked for worms by digging test holes using shovels. Poor soil conditions (hard packed dry soil) in the general areas of SS-11 and SS-12 made digging by shovel difficult. Therefore, earthworm sampling locations were selected as close as possible to these locations (HN-#2 and HS-#1, respectively). The central section of the main cap was tested and two sampling locations were selected adjacent the "perched wetland area of reeds" (LS-#3) and north of this area at a lower elevation (LN-#4). Both areas appeared to be slightly moister than the other areas, and surface soil samples were collected next to both sites (SS-27 and SS-31, respectively). The two remaining earthworm sampling locations (MS-#5 and MN-#6) were placed in the vicinity of surface soil samples SS-13 and SS-34.

A large backhoe was used to scrape the surface layer of grass and sod (upper 4 inches) off an area of approximately 12 x 12 ft at each earthworm sampling location. That evening, sections of each area were watered to suppress dust and to attempt to bring worms closer to the surface. Sections were sampled the following days (19-20 August). Worms were found by turning the soil by shovel or fork, breaking the dried clumps apart, and carefully searching through the soil. Earthworms were placed in glass sample containers and held in a cooler with ice. The watered areas did not appear to attract or bring worms closer to the surface. Most worms were coiled in a ball, probably attempting to conserve moisture and survive the very dry conditions present on site. Because the earthworms did not appear to be moving through the soil, it was believed they were in this position prior to the addition of water and that no movement was initiated as a result. Generally, there was a hardpan layer of clay about 10 to 12 inches below the surface that was not penetrated by water or shovel. This layer seemed to be just above the landfill debris as debris was often encountered sticking through the clay especially around SS-13.

Once collection was completed (approximately 26 hrs later), the samples were washed of dirt using DI water, drained, weighed and placed in a new glass sample container. Samples were placed in the laboratory supplied cooler with ice and a Chain of Custody, sealed, and delivered to Upstate Laboratories in East Syracuse, New York. Laboratory personnel were instructed that the samples should be kept at 4^{o} C. The laboratory was informed to contact CHA prior to the analysis of these samples because of the small amount of worm total sample mass.

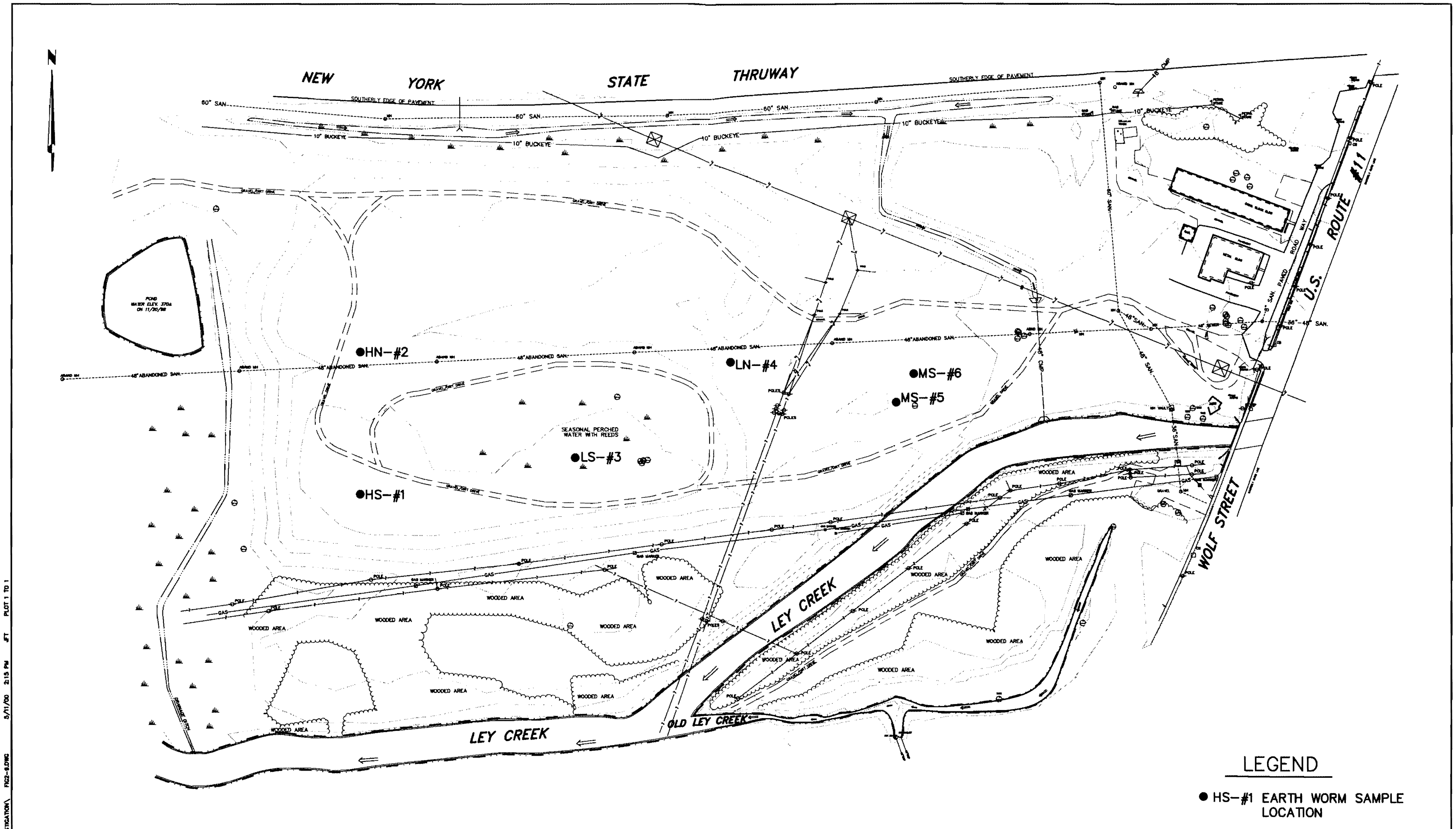

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FIGURE 2-9

EARTHWORM SAMPLE LOCATIONS

TOWN OF SALINA LANDFILL RI/FS

Samples that were delivered to Upstate Laboratories, Inc. included:

- HS-#1- one worm (not weighed)
- HN-#2- two worms (not weighed)
- LS-#3- 80 worms (27 g)
- LN-#4- 100 worms (30 g)
- MS-#5- 8 worms (3.5 g)
- MN-#6- 31 worms (12 g)

The total mass of earthworms collected at the site was very low for the effort expended. This was probably due to the severe drought conditions that had been in effect in the region for most of the summer prior to the sampling event, rendering the site soils to be very dry and not conducive to earthworm survival or growth. Since Upstate Laboratories required 30g of sample mass for analysis of PCBs, 30g for SVOCs/PAHs, and 10g for metals, it was decided to composite the worms from all six sampling locations and to analyze the composite sample for SVOCs, PCBs, and metals. A concern was raised that if a problem was encountered during analysis, there might not be enough material for all three analyses. Therefore, PCBs were designated the lowest priority of the three contaminant classes to be analyzed.

2.6 LABORATORY ANALYSIS

All samples collected during the Phase I Investigation were submitted to RECRA Environmental, Inc. (RECRA) for analysis. Because RECRA was not able to meet contract schedule requirements, they were not retained to perform the analyses for the samples collected during the Phase II Investigation. Therefore, all samples collected during the Phase II Investigation were submitted to Upstate Laboratories, Inc. (ULI), who was the second lowest bidder, for analysis. Sample analyses were performed using Analytical Services Protocols and Methods (ASP 95-1 for VOCs; ASP 95-2 for SVOCs; and ASP 95-3 for pesticides and PCBs). Metals were analyzed by CLP-M methods. The data was transmitted from the laboratories to CHA in ASP Category B package, in both hard copy form and electronic format.

2.7 DATA VALIDATION AND EVALUATION

Data validation is an important function in the determination of whether all chemical data generated during the RI is usable. Data collected during the Phase I Investigation was validated by Nancy Potak. Ms. Potak provided a narrative discussion outlining all QC issues and recommended data qualifiers. The complete data validation report is on file in CHA's office. Appendix D-1 includes the Data Compliance Summary that was prepared as part of the full data validation report for this data set as well as the descriptive sections of the data validation reports.

For the Phase II Investigation, LMS prepared a Data Usability Summary Report (DUSR) after review of the laboratory data. The DUSR for the data generated during the Phase II Investigation data is included in Appendix D-2.

The laboratory data was compiled into tables that are included in Appendix C. The tables were separated by following matrices:

- Appendix C-1: Groundwater
- Appendix C-2: Leachate
- Appendix C-3: Surface Water
- Appendix C-4: Sediment
- Appendix C-5: Surface Soil (and Earthworms)
- Appendix C-6: Subsurface Soil

The original lab data for each individual sample was placed into columns for each data table. The validated data, including all qualifiers, was then placed in a column next to the original lab data to provide a means for a direct comparison. Note that the tables in Appendix C and related tables presented in Section 4 below were constructed using data transmitted to CHA electronically to minimize the potential for errors. A complete list of the data qualifiers is provided in the beginning of Appendix C. Applicable data qualifiers are also presented on each table in Section 4.

Upon compiling all the data into tables, a summary table was developed for each matrix. The original laboratory data was excluded from the summary tables as only the validated data was evaluated in the report text. In addition, all data qualified with a "U" indicating that it was not detected above the instrument detection limit and all rejected data qualified with a "R" was not included in the summary tables. Organic data qualified with a "B" was only included in cases where the concentration of an analyte was five times or greater than the detection limit for that analyte. Data qualified with a "J" is considered estimated but was included in the summary table. It should be noted that analytes that were not detected in any of the samples were excluded from the summary tables.

For each summary table, an additional column was inserted next to the analyte and units columns to include the appropriate New York State standard or guidance value. All compound concentrations that equal or exceed the standard or guidance value were shaded and boldfaced. In several cases (e.g., metals concentrations in soils), the guidance value is based on the site background concentration for a particular parameter. In these instances, if more than 1 background sample was available, results for each parameter were averaged. If a parameter was not detected in one or more of the background samples, a value equal to ½ of the detection limit was used as the representative concentration for that parameter. For subsurface soil samples, there were no background samples collected; therefore the data from the background surface soil samples (SS-40 and SS-41) were used to represent background for subsurface soil. For sediment samples, the total organic carbon (TOC) content is used to calculate the site-specific sediment guidance value. For simplification, the TOC content of all sediment samples was averaged together and the average value was used in the calculation.

The discussion of contaminant distribution presented in Section 4 includes both a comparison of data from all sampling points to standards and guidance, as well as a comparison of data from downgradient sample locations to data from upgradient locations.

Note that the identification of standards or guidance values for the tables in Section 4 was limited to a single set of values. Additional standards or guidance values that are available and applicable were used for the evaluation of risk to human health and the environment, as presented in Sections 6 and 7. Additionally, the data handling procedures and statistical methods used to quantify risk are explained in greater detail in those sections.

3.0 PHYSICAL SETTING

3.1 PHYSICAL FEATURES

3.1.1 Historical Land Use

As mentioned in Section 2, prior to conducting any fieldwork, CHA reviewed historical aerial photographs to delineate an approximate limit of waste and develop an understanding of the development of the site. For the purposes of discussion, the "site" in the following paragraphs refers to an area currently bordered by the New York State Thruway on the north, Route 11 on the east, the Onondaga County Resource Recovery Agency (OCRRA) Transfer Station on the west, and Ley Creek on the south. A chronological panel of site sketches summarizing the significant features in each of the photographs is depicted in Figure 3-1 (excluding 1951). The following paragraphs summarize CHA's interpretations of the photographs:

1951 Photograph (Scale: 1" = 1200')

In 1951, the site was largely undeveloped. Several buildings were located along Route 11, in the approximate position of currently existing buildings. The New York State Thruway was present to the north of the site, and the Ley Creek Sewage Treatment Plant was located to the west of the site. A cultivated field was present on the eastern end of the site. A dirt road or pathway crossed the site from east to west, between the sewage treatment plant and Route 11. Much of the site appears to exist as a low-lying wetland. A pond was also located on the eastern end of the site, near Ley Creek. Ley Creek appeared as a narrow channel in its "old" position (see discussion under 1972 photograph). No observable landfilling activity was noted.

1959 Photograph (Scale: 1" = 600')

The 1959 photograph is quite similar to the 1951 photograph. Landfilling has not begun on site.

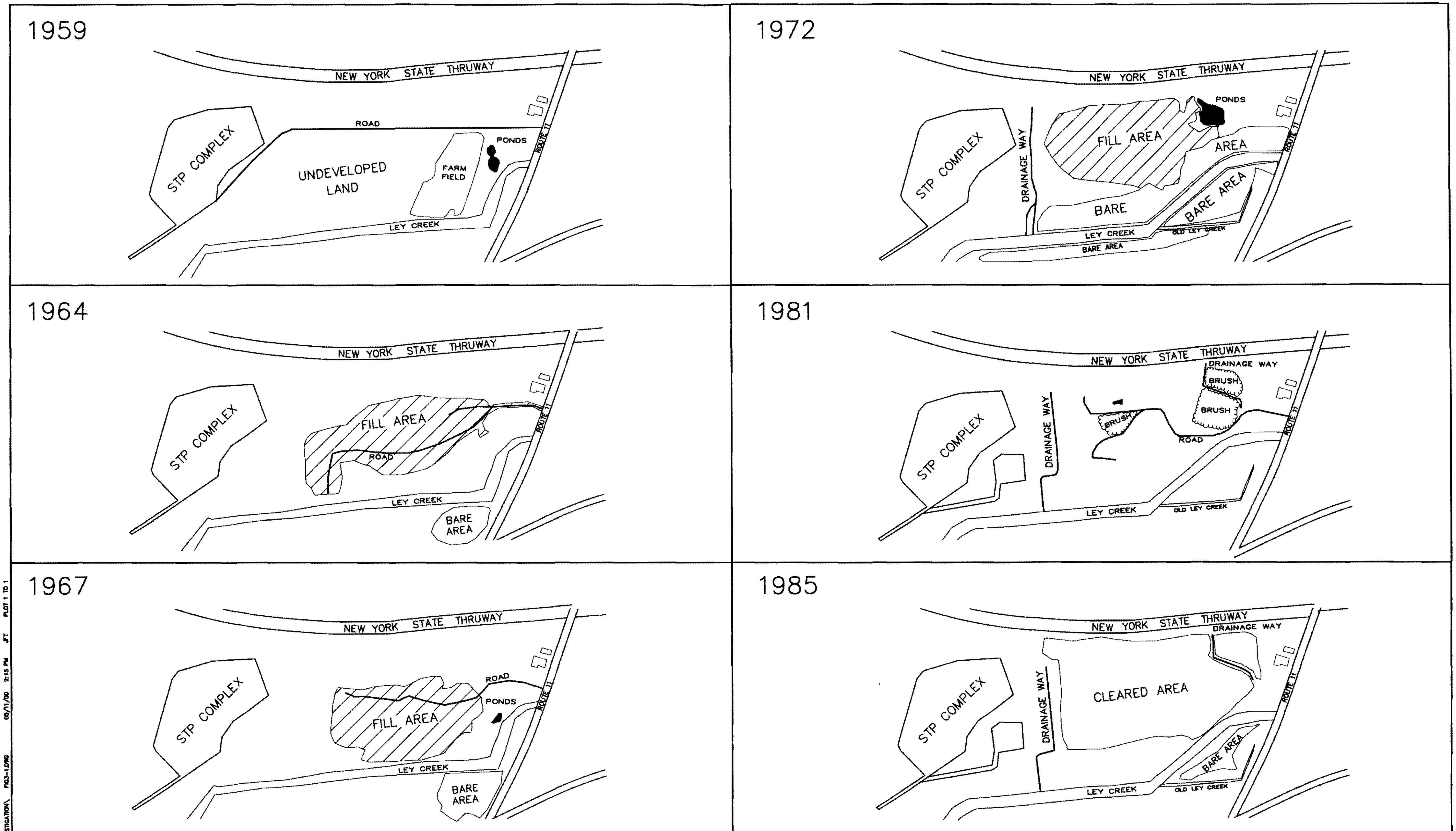

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FIGURE 3–1
SUMMARY OF HISTORICAL AERIAL PHOTOGRAPHS
TOWN OF SALINA LANDFILL RI/FS

1964 Photograph (Scale: 1" = 1000')

In the 1964 photograph, there is clear evidence of the landfill on the site. The area of fill is located in an east-west swath across the site. The east-west roadway, visible in the 1951 and 1959 photographs, is not apparent in the 1964 photograph. A roadway is visible extending through the area being filled. Additionally, the pond that previously existed on the eastern end of the site is no longer apparent.

1967 Photograph (Scale: 1" = 800')

The area of fill has expanded in the 1967 photograph and extends almost to Ley Creek at its southernmost extent. A small embayment or pond is located adjacent to Ley Creek near the eastern end of the site. Several power poles are visible in the photograph.

1972 Photograph (Scale: 1" = 800')

The area of active filling has shifted slightly to the north and has expanded again since 1967. A new channel for Ley Creek has been created and Ley Creek has been widened. Remnants of the former channel are still visible in the photograph. Large areas of bare land parallel the new channel and are interpreted to be dredge spoilings from the new Ley Creek channel. A large pond is present in the northeast quadrant of the site, adjacent to an apparent active area of filling. Several drainageways, leading to Ley Creek, are apparent in the western portion of the site.

1981 Photograph (Scale: 1" = 800')

No landfilling activities are evident on the 1981 aerial photograph. Several dirt roadways cross the site in a general east-west direction. The area of former landfilling appears to have been revegetated, including the area between the old Ley Creek channel and the new Ley Creek channel. A new drainage channel is apparent in the northeastern section of the site. The channel is in the approximate location of the pond noted in the 1972 photograph, although the pond is no longer present. Numerous features, interpreted to be trees, are located on both sides of the drainage channel. These same features are also located in a small area on the western portion of the site. A more formal drainageway now exists along the western border of the site. Additional areas of Ley Creek have been dredged both east and west of the site.

1985 Photograph (Scale: 1" = 2000')

In this photograph, the former landfill area appears to have been graded with soil. The area is either unvegetated or is covered by grasses. The area between the old Ley Creek channel and the new Ley Creek channel appears to have been stripped bare.

In summary, the aerial photographs corroborate other records that indicate that the landfill was operated from approximately 1960 to 1975. The area of fill extended near the Thruway on the north, up to Ley Creek on the south (with some waste between the old an the new channels of Ley Creek), near Route 11 on the east, and near the OCRRA Transfer Station on the west.

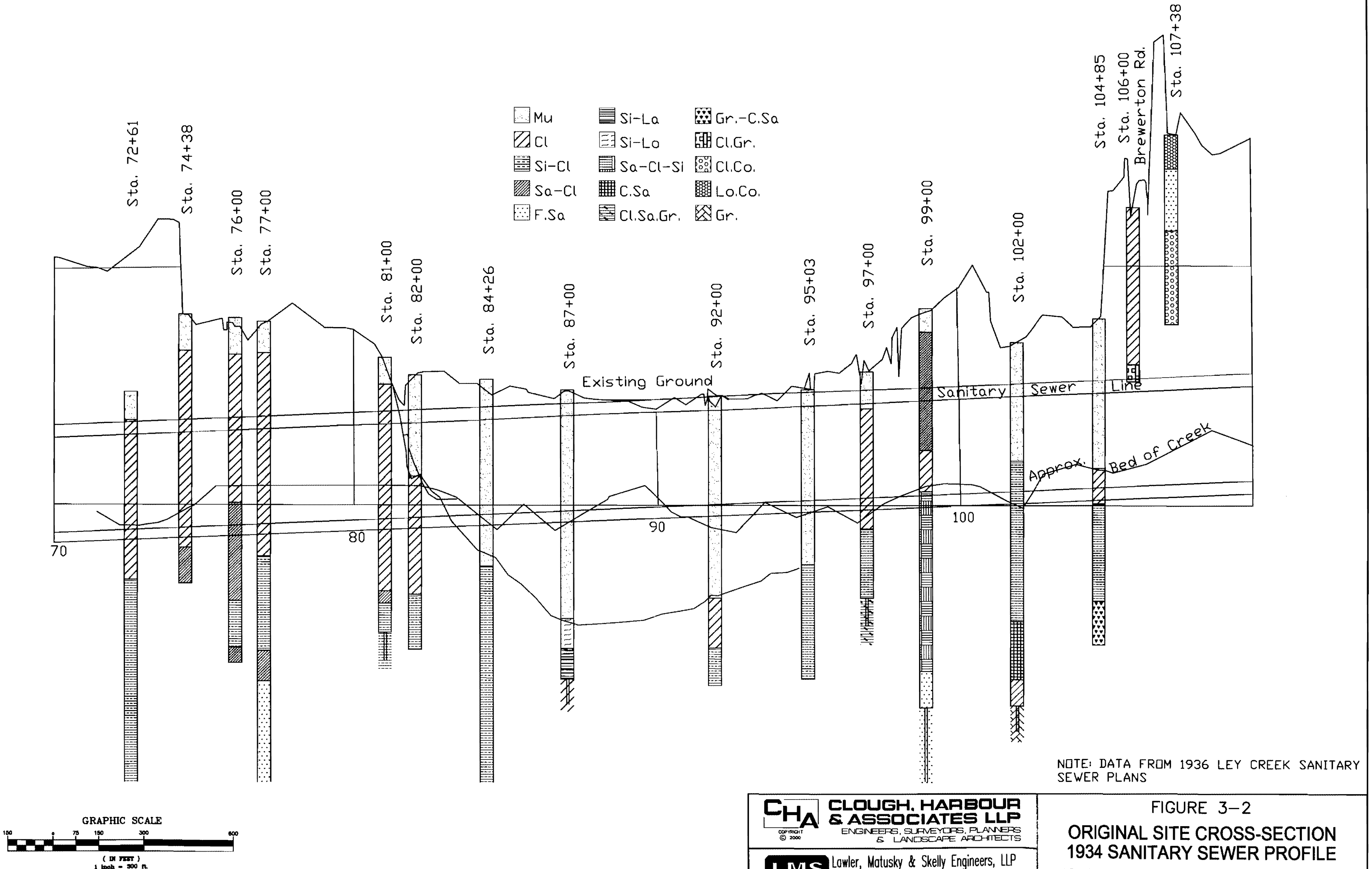
3.1.2 Site Topography

Review of the historical aerial photographs in stereo indicate that the site was originally a low-lying wetland area. This interpretation is supported by engineering drawings obtained from the Onondaga County Department of Drainage and Sanitation (OCDDS). Prior to installation of a sanitary sewer line in the 1930s, a series of borings were drilled across the site. Figure 3-2 has been reproduced from the original drawings. The figure shows that much of the site lay at an elevation approximately 7-9 feet below Route 11. The figure also shows the shallow subsurface materials encountered in the test borings largely consisted of muck.

The topographical survey conducted during this remedial investigation shows that the highest elevation on the landfill is approximately 392 feet above mean sea level. This is approximately 30 feet above the level of Ley Creek and 20 feet above Route 11 and the New York State Thruway. A detailed topographic map of the site is included as Plate 1.

3.1.3 Site Utilities

A number of overhead and underground utilities are located on site. Overhead power lines cross the site in an east-west direction within property owned by Niagara Mohawk. A Niagara



NOTE: DATA FROM 1936 LEY CREEK SANITARY SEWER PLANS

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FIGURE 3-2

ORIGINAL SITE CROSS-SECTION 1934 SANITARY SEWER PROFILE

TOWN OF SALINA LANDFILL RI/FS

Mohawk underground natural gas pipeline is also located within this property. Overhead power lines also cross the site in a northeast-southwest direction.

An abandoned sanitary sewer crosses the site in an east-west direction within property owned by Onondaga County. This sewer was installed in the 1930s. The sewer pipe is a U-shaped concrete pipe, 48 inches in diameter. An active sanitary enters the site from Route 11 on the south side of Ley Creek. The sewer is constructed of concrete. The sewer runs north under the creek up to the New York State Thruway and then west along the Thruway. A 10-inch diameter Buckeye Pipeline also runs along the northern edge of the site parallel to the sanitary sewer. The location of all known overhead and underground utilities are depicted on Plate 1.

3.2 SITE HYDROLOGY

3.2.1 Surface Water Bodies

As mentioned previously, Ley Creek flows along the southern boundary of the landfill. Ley Creek is located in the Onondaga Lake drainage basin on the northeast end of Onondaga Lake (NYCDEC 1996). From Onondaga Lake upstream to the Ley Creek Sewage Treatment Plant outfall, the creek is class C water (with Class C standards). From the sewage treatment plant outfall to a point 3.1 miles above the mouth, the creek is Class B water (Class B standards). The entire section of Ley Creek adjacent the landfill is identified as Class B water, and is protected under NYSDEC (6NYCRR Part 608, Use and Protection of Waters).

The old channel of Ley Creek begins in a wet area just west of Route 11. There is little to no observable flow in the channel over most of its length. Flow is observed only near the confluence with the main channel of Ley Creek.

LMS measured a number of physical parameters of Ley Creek in 1998, which are presented in Table 3-1. The upstream sections of Ley Creek contained a higher percentage of sand and gravel in bottom sediments compared to the downstream sections, which had higher percentages of silt. Percentages were determined by examining ponar grab samples for grain size. The creek depth and width increased downstream, but flow was about the same. Canopy cover decreased downstream. Few macrophytes were present; emergent vegetation was much more common downstream and showed no indication of stress (see Photographs 5 and 6, Appendix A-3). The

TABLE 3-1
RESULTS OF PHYSICAL CHARACTERIZATION
SALINA LANDFILL – LEY CREEK

Approximate location	**Upstream** Station #1	**Upper middle** Station #2	**Lower middle** Station #3	**Downstream** Station #4
Date sampled	23 July 98	23 July 98	23 July 98	23 July 98
Temperature ºC	21.0ºC	21.0ºC	21.1ºC	21.4ºC
Conductivity µmhos	136	130	132	137
Dissolved oxygen mg/λ	5.7	5.8	5.6	5.4
pH	7.3	7.7	7.8	7.8
Turbidity	Not taken	Not taken	Not taken	Not taken
Stream depth (inches)	18"	16"	13"	20"
Stream width (feet)	30'	65'	70'	70'
Stream flow (cfs)	50-60	50-60	50-60	50-60
Canopy cover (%)	15	10	5	5
Vegetation*				
Suspended algae	none	none	none	none
Filamentous algae	none	none	none	none
Diatoms	none	none	none	none
Macrophytes	none	some	some	some
Substrate*				
Rock (%)	0	0	0	0
Rubble (%)	0	0	0	0
Gravel (%)	20	20	0	0
Sand (%)	80	70	40	20**
Silt (%)	0	10	60	80

Turbidity was not taken due to heavy rain before the survey creating very turbid waters.

*Vegetation and substrate characteristics based on visual observations.

**Fine sand

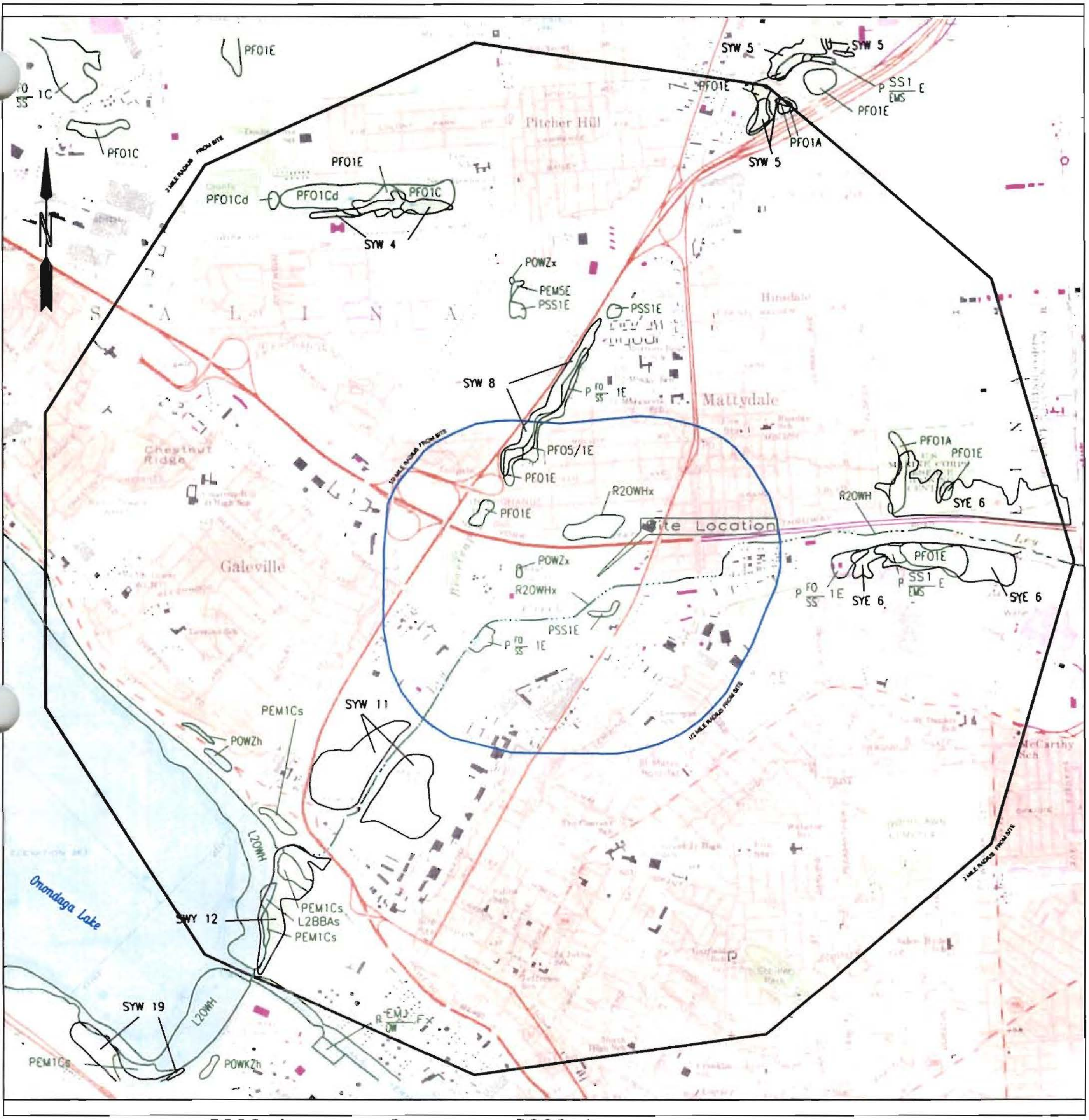
stream provides habitat for a variety of warmwater species but lacks instream structure and vegetation to provide cover/protection. Because it is channelized, sediments may be rapidly transported downstream during heavy rain/snow melt events. Movements of sediments during high flow events may disturb some benthic invertebrates. Temperature and pH increased slightly downstream. Dissolved oxygen (range 5.4-5.8 ppm) decreased slightly downstream, while conductivity (range 130-137 µmhos) remained about the same. These conditions are not limiting to the warmwater fish species expected to occur in Ley Creek.

In addition to Ley Creek, there are several other surface water bodies or drainage swales on site. A drainage swale is located along the northern edge of the site running parallel to the New York State Thruway. This swale receives surface water runoff from three sources: a wetland area on the north side of the Thruway; directly from the Thruway; and from the northern portion of the landfill. Water is conveyed from west to east through the swale, then to another open swale running in a north-south direction across the site. About midway across the site, the swale drains into a covered 48-inch diameter corrugated metal pipe. The pipe conveys storm water directly into Ley Creek. The swale running parallel to the Thruway does not have a well-defined channel, but the north-south running swale does have a well-defined channel.

Another drainage swale is located slightly beyond the western edge of the site. This drainage swale runs from north to south, discharging into Ley Creek. The swale does not have a well-defined channel until it approaches Ley Creek. The swale collects surface water runoff from the western portion of the site as well as the eastern portion of the OCRRA Transfer station. A small pond is located near this drainage swale, but is not apparently connected to the swale.

3.2.2 Wetlands

Wetland resources within the survey area were identified using both state and Federal wetland maps. National Wetland Inventory (NWI) maps, prepared by USFWS, and the Freshwater Wetland Map (Syracuse West USGS quadrangle), prepared by NYSDEC, were used primarily to identify freshwater wetland resources in the study area. Other materials consulted as part of the desktop analysis included Onondaga County soil maps, aerial photographs of the project site, and the Federal Emergency Management Agency (FEMA) Floodplain Boundary Maps for the study area. Six NYSDEC wetlands and about 20 NWI wetlands occur within a 2-mile radius of the site (Figure3-3). NYSDEC wetland SYW 12 contains two significant wetland habitats – an inland salt marsh and an inland salt pond – located southwest of the site between Route 57 and Onondaga Lake, about 1.4 miles from the site. The same resources were used for the



3000 ft 0 3000 ft

1 in. = 3000 ft

LEGEND

WETLAND BOUNDARIES

NATIONAL WETLANDS INVENTORY-LISTED

NYSDEC STATE INVENTORY-LISTED

MAP SOURCE:
USGS 7.5-MINUTE QUADRANGLE MAP
SYRACUESE-WEST, NY 1973, PHOTOREVISED 1978
SYRACUSE-EAST, NY 1957, PHOTOREVISED 1978
AND NYS FRESH WATER AND NATIONAL WETLAND
INVENTORY MAPS-INVENTORY

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FIGURE 3-3

FEDERAL & STATE MAPPED WETLANDS WITHIN 2 MILES OF THESITE

TOWN OF SALINA REMEDIAL INVESTIGATION

I:\6967\DRAWINGS\R... INVESTIGATION\ FIG3-3.DWG 5/5/00 3:10 PM JFT PLOT 1 TO 1

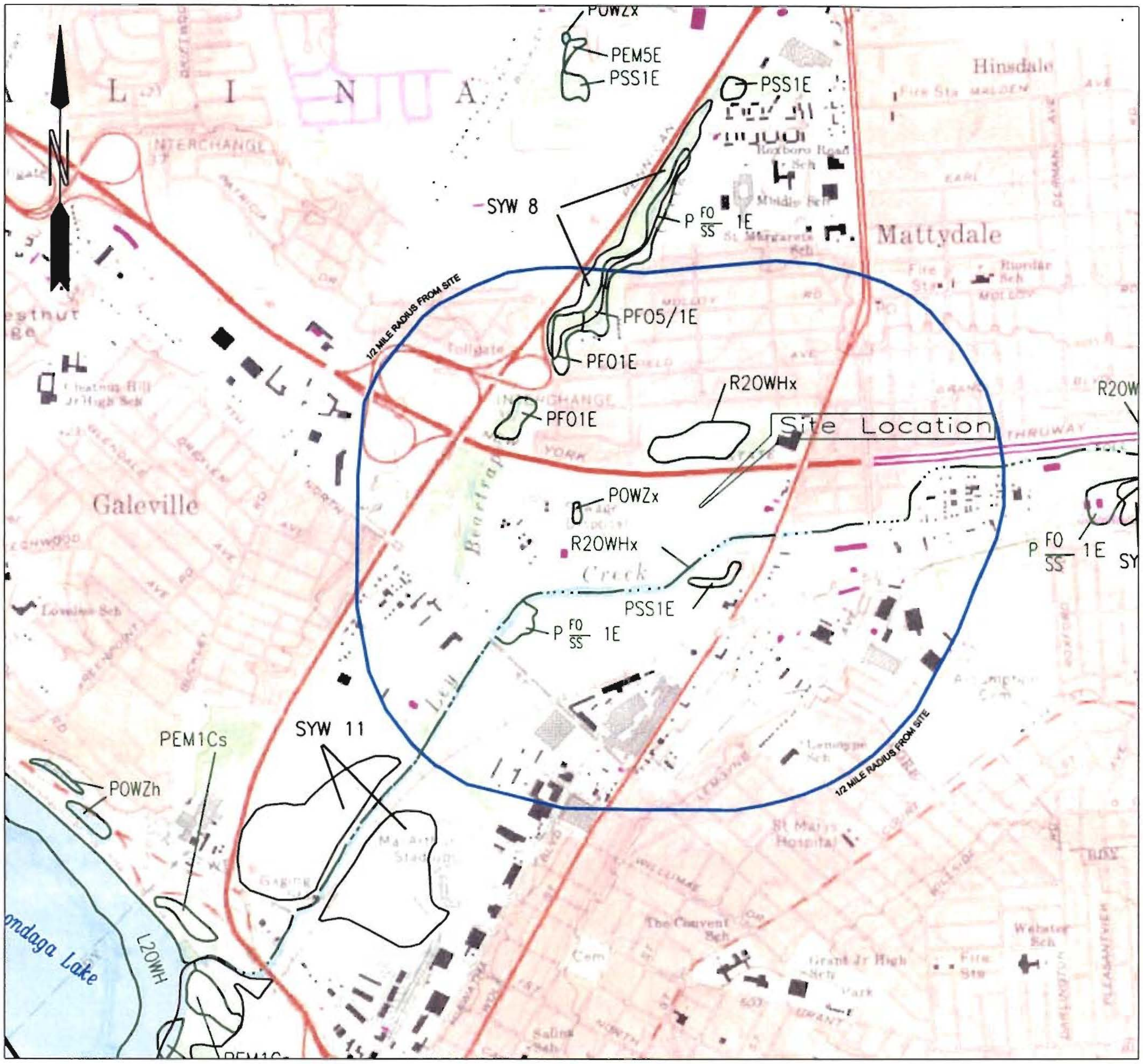
preliminary identification of plant communities within the study area for the covertype verification survey.

The NWI maps use the Classification of Wetlands and Deep-Water Habitats of the United States (Cowardin et al. 1979) to classify wetland types. This classification is hierarchical, proceeding from general to specific, and emphasizes wetland hydrology, vegetation, and hydric soils (Tiner 1985). Wetlands may be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; and may exist as small permanent or intermittent water bodies (Cowardin et al. 1979). Considerable differences in vegetation can exist between palustrine wetlands due to hydrology, water chemistry, soils, and human disturbance (Tiner 1985). Hydrology (permanently, semipermanently, or temporarily flooded) is usually the dominant factor determining vegetation types. Wetland classifications identified in the Salina landfill study area include palustrine, lacustrine, and riverine systems. Wetland classifications identified by the NWI maps in the study area are listed below.

> *Riverine* – Riverine wetlands are associated with flowing water, nontidal waters with little emergent vegetation (Reschke 1990).
>
> *Lacustrine* – Lacustrine wetlands are associated with nonflowing waters such as lakes, ponds, and impoundments. There are none identified at the Town of Salina Landfill; however, a small pond just to the west of the landfill could be considered in this classification.
>
> *Palustrine* - Palustrine wetlands include all freshwater wetlands not associated with drainage ditches, streams, rivers, ponds, impoundments, lakes, and estuarine situations.

The NYSDEC Freshwater Wetland Maps for the study area (Syracuse East and Syracuse West USGS quadrangles for Onondaga County) were obtained and reviewed. No NYSDEC-mapped wetlands were identified within the study area. The NWI maps provided the location of three wetlands, including Ley Creek, within or adjacent to the study area and four within 0.5 miles of the site (Figure 3-4). One NYSDEC Wetland (SYW 8) along Beartrap Creek extends into the 0.5 mile boundary.

Review of the NWI wetland map indicated three wetlands are present on site. The NWI-listed wetlands were as follows:



LEGEND

WETLAND BOUNDARIES

NATIONAL WETLANDS INVENTORY-LISTED

NYSDEC STATE INVENTORY-LISTED

MAP SOURCE:
USGS 7.5-MINUTE QUADRANGLE MAP
SYRACUESE-WEST, NY 1973, PHOTOREVISED 1978
SYRACUSE-EAST, NY 1957, PHOTOREVISED 1978
AND NYS FRESH WATER AND NATIONAL WETLAND
INVENTORY MAPS-INVENTORY

2000 ft 0 2000 ft

APPROXIMATE SCALE
1 in. = 2000 ft

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FIGURE 3-4

FEDERAL AND STATE MAPPED WETLANDS WITHIN 1/2 MILE OF THE SITE

TOWN OF SALINA REMEDIAL INVESTIGATION

I:\5967\DRAWINGS\R...ESTIGATION\ FIG3-4DWG 5/11/00 3:10 PM JFT PLOT 1 TO 1

- *POWZx:* A small open water and emergent wetland just west of the site with emergent sections extending onto the site boarders.

- *PSS1E:* A small shrub and emergent wetland with open water areas. The wetland is in the old Ley Creek channel.

- *R20WHx:* An open water mid-reach stream with some areas of emergent wetlands along the stream borders.

The presence of all three wetlands was verified and the size and shape of the wetlands were as indicated on the NWI maps. In addition, there are strips of wetlands on the edges of the landfill that were not identified on the NWI maps that are described as follows:

- A wetland area maintained as a narrow 20- to 40-ft-wide reedgrass/purple loosestrife marsh (PSS1E) running between the New York State Thruway and the north side of the landfill (Photographs No. 1 and 2, Appendix A-3). This wetland drains southeast across the landfill as part of an artificial intermittent stream (Figure 3-5).
- A wetland area maintained on a narrow 20- to 60-ft-wide purple loosestrife marsh (PSS1E) running along the west edge of the landfill and draining south into a larger shallow emergent marsh along Ley Creek (Figure 3-5).

The Town of Salina Landfill was placed over an extensive wetland area as determined from analysis of Onondaga County soil maps and historical aerial photographs. The soil maps indicate that the "made land" (Salina Landfill) is almost completely surrounded by Carlisle Muck (Ce) soils. This is a hydric soil type as identified by the U.S. Department of Agriculture (USDA) Soil Conservation Service. The historical air photographs from 1951 and 1959 indicate that most of the landfill was once part of a large, continuous wetland area that was bisected at the north end by the New York State Thruway. The 1967 air photograph shows the landfill covering approximately 40% of the existing landfill area and encroaching into wetland areas. Most of the landfill is in the southeast quadrant graph and in the eastern half of the southwest quadrant, with some encroachment into the northern half of the future landfill. The 1972 air photo shows the redirected Ley Creek channel with the landfill encroaching further into the wetland areas to nearly 80% of its present size, including the bisected section. By 1981, the landfill is about full size, and in 1985 photographs show disturbance in the bisected section. The resulting or

remaining wetland areas are along the north and west edges of the landfill and can be described as ditches with emergent and floating vegetation.

3.3 SITE ECOLOGY

3.3.1 Wildlife Survey Results

During the 22 to 24 July 1998 wildlife survey, a total of 54 species, including nine mammals, 42 birds, two reptiles, and one amphibian, were identified (Tables 3-2 and 3-3). In November 1997, the common merganser and black duck were observed during the initial site visit but were not found during the July 1998 surveys. Waterfowl are also expected to be present on or near the site because they overwinter along Ley Creek. They are further discussed with bird observations below.

3.3.1.1 Mammals

During the wildlife surveys, few mammals were observed (Tables 3-2 and 3-3). Because the area consists predominantly of tall grasses, rodents (including woodchucks and meadow voles) were expected to be common. Although woodchucks were observed, there was little evidence (holes and runways) that they were common on the site. Small mammals such as meadow voles, deer/white-footed mice, and short-tailed shrews were not directly observed. There was some evidence of small mammals, including runways and burrow openings; however, these indicators were not common in the grasses on the landfill where meadow voles would be expected. Predators such as the red-tailed hawk and fox were uncommon, indicating that this area may not contain suitable numbers of prey to support these predators.

White-tailed deer were common in wooded areas as evidenced by trails and droppings. These deer most likely feed in the grassy and shrubby areas of the landfill. Muskrat were common along Ley Creek and probably feed on cattails and other aquatic vegetation. Cottontail rabbits were also present but not common on the site; this species feeds on grasses and woody vegetation on and adjacent to the landfill.

No mammals listed as TES or special concern species were found on site, are expected to occur in the area, or were identified by the agencies.

TABLE 3-2
VERTEBRATE SPECIES OBSERVED ON OR ADJACENT TO THE SITE
TOWN OF SALINA LANDFILL

Common Name	Scientific Name	Common Name	Scientific Name
BIRDS		**BIRDS (cont'd.)**	
Great blue heron	*Ardea herodias*	American goldfinch	*Carduelis tristis*
Green heron	*Butorides striatus*	House sparrow	*Passer domesticus*
Wood duck	*Aix sponsa*	Black duck**	*Anas rubripes*
Mallard	*Anas platyrhynchos*	Merganser**	*Mergus sp.*
Red-tailed hawk	*Buteo jamaicensis*		
Wild turkey	*Meleagris galloparo*	**AMPHIBIANS**	
Spotted sandpiper	*Actitis macularia*	Green frog	*Rana clamitans*
Solitary sandpiper	*Tringa solitaria*		
Ring-billed gull	*Larus delawarensis*	**REPTILES**	
Rock dove	*Columbia livia*	Snapping turtle	*Chelydra serpentina*
Mourning dove	*Zenaidura macroura*	Midland painted turtle	*Chrysemys picta*
Ruby-throated hummingbird	*Archilochus colubris*		
Chimney swift	*Choetura pelagica*	**MAMMALS**	
Belted kingfisher	*Megaceryle alcyon*	Shrew	*Blarina sp./Sorex sp.*
Downy woodpecker	*Picoides pubescens*	Eastern cottontail	*Sylvilagus floridanus*
Northern flicker	*Colaptes auratus*	Woodchuck	*Marmota monax*
Least flycatcher*	*Emp[idonax minimus*	White-footed/deer mouse	*Peromyscus sp.*
Willow flycatcher	*Empidonax traillii*	Meadow vole	*Microtus pennsylvanicus*
Eastern phoebe	*Sayornis phoebe*	Muskrat	*Ondatra zibethica*
Eastern kingbird	*Tyrannus tyrannus*	Fox (red/gray)	*Vulpes/Urocyon*
Barn swallow	*Hirundo rustica*	Raccoon	*Procyon lotor*
Blue jay	*Cyanocitta cristata*	Whitetail deer	*Odocoileus virginianus*
American crow	*Corvus brachyrynchos*		
Black capped chickadee	*Parus atricapillus*		
House wren	*Troglodytes aedon*		
American robin	*Turdus migratorius*		
Gray catbird	*Dumetella carolinensis*		
Cedar waxwing	*Bombycilla cedrorum*		
European starling	*Sturnus vulgaris*		
Yellow warbler	*Dendroica petechia*		
Common yellowthroat	*Geothlypis trichas*		
Northern cardinal	*Cardinalis cardinalis*		
Savannah sparrow	*Passerculus sandwichensis*		
Song sparrow	*Melospiza melodia*		
Red-winged blackbird	*Agelaius phoeniceus*		
Eastern meadowlark	*Sturnella magna*		
Common grackle	*Quiscalus quiscula*		
Brown-headed cowbird	*Molothrus ater*		
Baltimore oriole	*Icterus galbula*		
House finch	*Carpodacus mexicanus*		

* = observed June 1998 by NYSDEC personnel

** = observed on-site in autumn 1998

TABLE 3-3
SALINA LANDFILL WILDLIFE OBSERVATION TRANSECTS.
SPECIES AND NUMBERS OBSERVED 22-24 JULY 1998. (PAGE 1 OF 2)

Species	Thruway transect	Mid transect	Streamside transect	Cutoff site transect	Ley Creek transect	Incidental sightings
MAMMALS						
Mice, Voles, Shrews		P	P	P		P
Woodchuck			1			
White-tailed deer				3		P
Raccoon						P
Eastern cottontail			2			P
Muskrat					3	P
Fox						P
TOTAL MAMMAL SPECIES	0	1	3	2	1	6
BIRDS						
Great blue heron			1		1	
Green heron			2			P
Wood duck			3			
Mallard	1	1		1	1	
Red-tailed hawk	1					
Wild turkey			P			
Solitary sandpiper					1	
Spotted sandpiper			1		2	P
Ring-billed gull	4	2	1			
Rock dove	3	1	3			
Mourning dove	6	3	8	4		
Chimney swift	1	1				
Ruby-throated hummingbird			1			
Belted kingfisher					2	P
Downy woodpecker			1			
Northern flicker	2		2		1	
Willow flycatcher	2	1	3	2	1	
Eastern phoebe				1		
Eastern kingbird			1	2	1	P
Barn swallow	4	6	5			P
American crow	1			2		P
Black-capped chickadee			4			

TABLE 3-3
SALINA LANDFILL WILDLIFE OBSERVATION TRANSECTS.
SPECIES AND NUMBERS OBSERVED 22-24 JULY 1998. (PAGE 2 OF 2)

Species	Thruway transect	Mid transect	Streamside transect	Cutoff site transect	Ley Creek transect	Incidental sightings
House wren			1	1		
American robin	3		9	3		
Gray catbird			6	2		
Cedar waxwing			18		6	
European starling	1	24	3			
Yellow warbler			2	2		
Common yellowthroat	1	3	4	4	1	
Northern cardinal			1			
Savannah sparrow		2				P
Song sparrow	2	4	15	5	1	
Red-winged blackbird	23	38	12	1	7	P
Eastern meadowlark						P
Common grackle			2	3	5	P
Brown-headed cowbird		4	7	1		
Baltimore oriole	1		1			
House finch	6	16	9			
American goldfinch	7	9	23	11	6	
House sparrow	2					P
TOTAL BIRD SPECIES	19	15	30	16	14	11
REPTILES						
Snapping turtle						P
Midland painted turtle						P
TOTAL REPTILE SPECIES	0	0	0	0	0	2
AMPHIBIANS						
Green frog				4		P
TOTAL AMPHIBIAN SP.	0	0	0	1	0	1

* All terrestrial transects are the combined counts of two early morning surveys. The Ley Creek transect was sampled only once. Incidental sightings were made throughout the study period and at all locations but are not included in the results of the transect surveys.

P = Present on-site

3.3.1.2 Birds

During the field surveys, a total of 42 species of birds were identified on-site (Tables 3-2 and 3-3). The New York State Breeding Bird Atlas Program (1980 to 1985) identified 84 species of breeding birds in the vicinity of the Town of Salina Landfill (Appendix A-1). Of the species identified, none were listed as threatened or endangered, and only three were listed as special concern species. Special concern species included the upland sandpiper, common nighthawk, and grasshopper sparrow. None of these special concern species were observed on site; however, habitat exists on the landfill that could support them.

The bird species observed on site were generally species expected to occur there. Successional old field, landfill/dump, floodplain forest, shallow emergent marsh, successional shrub, successional hardwoods, and backwater slough are ecological communities providing diverse habitats for birds. The successional shrub and hardwood communities found on-site may produce crops of seeds or berries that provide forage for birds, although the comparative lack of plant diversity in this community may limit its value to area wildlife. There was no evidence that birds were avoiding using the Town of Salina Landfill because of environmental stress. While most bird populations expected to be present were observed, some species were not observed and there was a low number of grassland/early successional species. However, grassland species have been in decline nationwide. In New York, declining species that favor open lands and grassy or early successional habitats include the horned lark, vesper sparrow, grasshopper sparrow, Savannah sparrow, and Henslow's sparrow, and the Eastern meadowlark (Bull 1998).

During the fall (November 1998) site visit, black ducks and common mergansers were observed on Ley Creek. Black ducks and common mergansers overwinter in the area and roost and forage in Ley Creek.

3.3.1.3 Reptiles

Two reptiles, the midland painted turtle and the snapping turtle, were identified on-site (Tables 3-2 and 3-3). The midland painted turtle was common in Ley Creek and emergent wetlands along the creek. It was also found in the backwater/bypassed channel of Ley Creek. In addition, several nests of midland painted turtles were found. The snapping turtle was identified indirectly by eggs found along the creek (one nest). All nests had been dug up and the eggs eaten by unknown predators (skunk, raccoon, fox, or opossum). Both the midland painted turtle and snapping turtle generally occur in wetlands and backwaters where there is some "open" or standing water. The midland painted is more common than the snapping turtle and is omnivorous, feeding on plants and animals (including small fish and crayfish). The spotty distributions of other turtle species in the Syracuse area may help to explain why no other turtles were identified.

No snakes were found on or adjacent to the site even though the habitat is one in which snakes are often found. The reason for the paucity of snakes on the site is unknown. Habitat and food, including worms, slugs, other invertebrates, small mammals, and frogs along Ley Creek observed during the survey were sufficient to support several species, including the northern water snake, common garter snake, northern brown snake, northern ringneck snake, and eastern milk snake. These species are within range of Syracuse and could be present on-site. The New York State Herpetological Atlas lists 12 reptiles that were found in the area of the Syracuse West and Syracuse East quadrangles (NYSDEC 1998). These species are listed in Table 3-4.

3.3.1.4 Amphibians

The green frog was the only amphibian observed on site (Tables 3-2 and 3-3). It was present in the backwater and emergent wetland areas of Ley Creek. No other amphibians (salamanders, frogs, or toads) were observed. The green frog's entire life history, from eggs to adults, occurs in a wet environment. They capture aquatic and terrestrial invertebrates and occasionally take small fish and amphibians. Larval green frogs feed on phytoplankton, algae, aquatic vegetation and detritus, and animal matter.

Because frogs generally prefer moist habitats, they were not expected to occur on the landfill, which consists predominantly of well-drained areas of capping material with underlying landfill material. American toads and salamanders were expected on and adjacent to the landfill, but none were observed. The most common New York salamander (northern redback salamander) was not found within the study area or on adjacent lands. The redback salamander is found in a variety of habitats, including floodplain forests, and is one of the easiest salamanders to find, when present, by searching under logs, rocks, leaves, and other debris. It was reported in the New York State Herpetological Atlas (NYSDEC 1998) as occurring in the both Syracuse West and Syracuse East quadrangles.

The New York State Herpetological Atlas lists 13 amphibian species in the vicinity of the Town of Salina Landfill, with 11 occurring in the Syracuse West quadrangle and 10 within the Syracuse East quadrangle (NYSDEC 1998). These species are listed in Table 3-4.

TABLE 3-4
REPTILES AND AMPHIBIANS IDENTIFIED IN THE VICINITY OF THE TOWN OF SALINA LANDFILL

Common name	Scientific Name	Syracuse West Quad	Syracuse East Quad
	REPTILES		
Common Snapping Turtle	*Chelydra s. serpentina*	√	√
Common Musk Turtle	*Sternotherus odoratus*	√	
Wood Turtle	*Clemmys insculpta*	√	
Midland Painted Turtle	*Chrysemys picta marginata*		√
Painted Turtle	*Chrysemys picta*	√	
Northern Water Snake	*Nerodia s. sipedon*	√	√
Northern Brown Snake	*Storeria d. dekayi*	√	√
Northern Redbelly Snake	*Storeia o. occiptomaculata*	√	
Common Garter Snake	*Thamnophis sirtalis*	√	√
Eastern Garter Snake	*Thamnophis s. sirtalis*		√
Northern Ringneck Snake	*Diadophis punctatus edwardsii*	√	
Eastern Milk Snake	*Lampropeltis t. triangulum*	√	√
	AMPHIBIANS		
Spotted Salamander	*Ambystoma maculatum*	√	
Red-spotted Newt	*Notophthalmus v. viridescens*	√	
Northern Dusky Salamander	*Desmognathus fuscus*	√	
Northern Redback Salamander	*Plethodon cinereus*	√	√
Northern Slimy Salamander	*Plethodon glutinosus*	√	√
Northern Two-lined Salamander	*Eurycea bislineata*	√	√
Eastern American Toad	*Bufo a. americanus*	√	√
Gray Treefrog	*Hyla versicolor-chrysoscelis*	√	√
Northern Spring Peeper	*Pseudacris c. crucifer*	√	√
Bull Frog	*Rana catesbeiana*		√
Green Frog	*Rana clamitans melanota*	√	√
Northern Leopard Frog	*Rana pipiens*	√	√
Pickerel Frog	*Rana palustris*		√

Source: New York Herpetological Atlas-Preliminary Results (June 1998)

3.3.1.5 Fish

Three informal fish observations/collections were made at the site by dipnet and backpack electrofisher. The first was done upstream of the landfill; the second, about midway where the old Ley Creek flows into Ley Creek; and the third, downstream of the landfill where Beartrap Creek intersects Ley Creek. Fish collected/observed included eight species (Table 3-5). The common carp was very abundant along the river; approximately 50 were counted along Ley Creek adjacent to the landfill during a single canoe trip downstream. Of the small minnows/forage fish observed, collections indicated that creek chubs and blacknose dace were also abundant, along with tessellated darters and brook sticklebacks. The fathead minnow, white sucker, and pumpkinseed were less common. Fish were also observed but not identified in the shallow emergent marsh streams and ditches north and west of the landfill, which may also be used by fish-eating predators.

3.3.1.6 Macroinvertebrates

The results of the macroinvertebrate survey are presented in Table 3-6. The macroinvertebrate sampling data indicated that species richness (i.e., number of taxa) and diversity (i.e., combination of richness and equitability) may be higher upstream than downstream. Further sample analysis would be required to determine if downstream macroinvertebrate communities are impaired. No obvious signs of stress to benthic macroinvertebrates were observed during field sampling. A freshwater mussel, tentatively identified as the eastern floater (*Pyganodon cataracta*), was found in Ley Creek. Two live specimens were found, one just below the Route 11 bridge and the other where Old Ley Creek channel enters the main channel of Ley Creek (Figure 2-2).

3.3.2 Ecological Communities

The majority of the project area and surrounding areas were modified and maintained by human activities that resulted in changes in physical conformation and biological composition of the land (Figure 3-6). The character of the existing resident ecological community is substantially different from that of the substrate or community as it existed prior to human influence

(Photographs 3 and 4, Appendix A-3). Several historical air photographs have been obtained to provide a photographic sequence of changes that have occurred at the site over the last 47 years; these changes have been discussed above.

TABLE 3-5
FISH SAMPLING RESULTS FOR SALINA LANDFILL & LEY CREEK SAMPLING AREAS

		Number Observed		
Common name	Species	Upstream Station 1	Mid-stream Station 2	Downstream Station 3
Common carp	*Cyprinus carpio*	P	P	P
Blacknose dace	*Rhinichthys atratulus*	42	212	261
Fathead minnow	*Pimephales promelas*	0	2	0
Creek chub	*Semotilus atromaculatus*	6	104	150
White sucker	*Catostomus commersoni*	0	1	0
Brook stickleback	*Culaea inconstans*	2	6	4
Pumpkinseed	*Lepomis gibbosus*	0	0	1
Tessellated darter	*Etheostoma olmsetdi*	8	0	2
Total species		5	6	6
Total fish		58	313	400

P = abundantly present on site

TABLE 3-6
SALINA LANDFILL – LEY CREEK
MACROINVERTEBRATE SAMPLING RESULTS

Approximate Location Groups	Upstream Station #1*	Upper Middle Station #2**	Lower Middle Station #3**	Downstream Station #4**
Oligochaete worms	1688	400-500	500	100
Chironomid larvae	80	20-30	30	5
Amphipods	32	0	60	0
Bivalvia	16+ shells	few shells	shells only	few shells
Gastropodia	8+ shells	few shells	shells only	few shells
Total	1824	465	590	105

* Count based on one sample at Station #1

** Estimate – based on one sample at Stations 2, 3, &4

Replicate samples taken – all samples were preserved and stored for later analysis if requested.

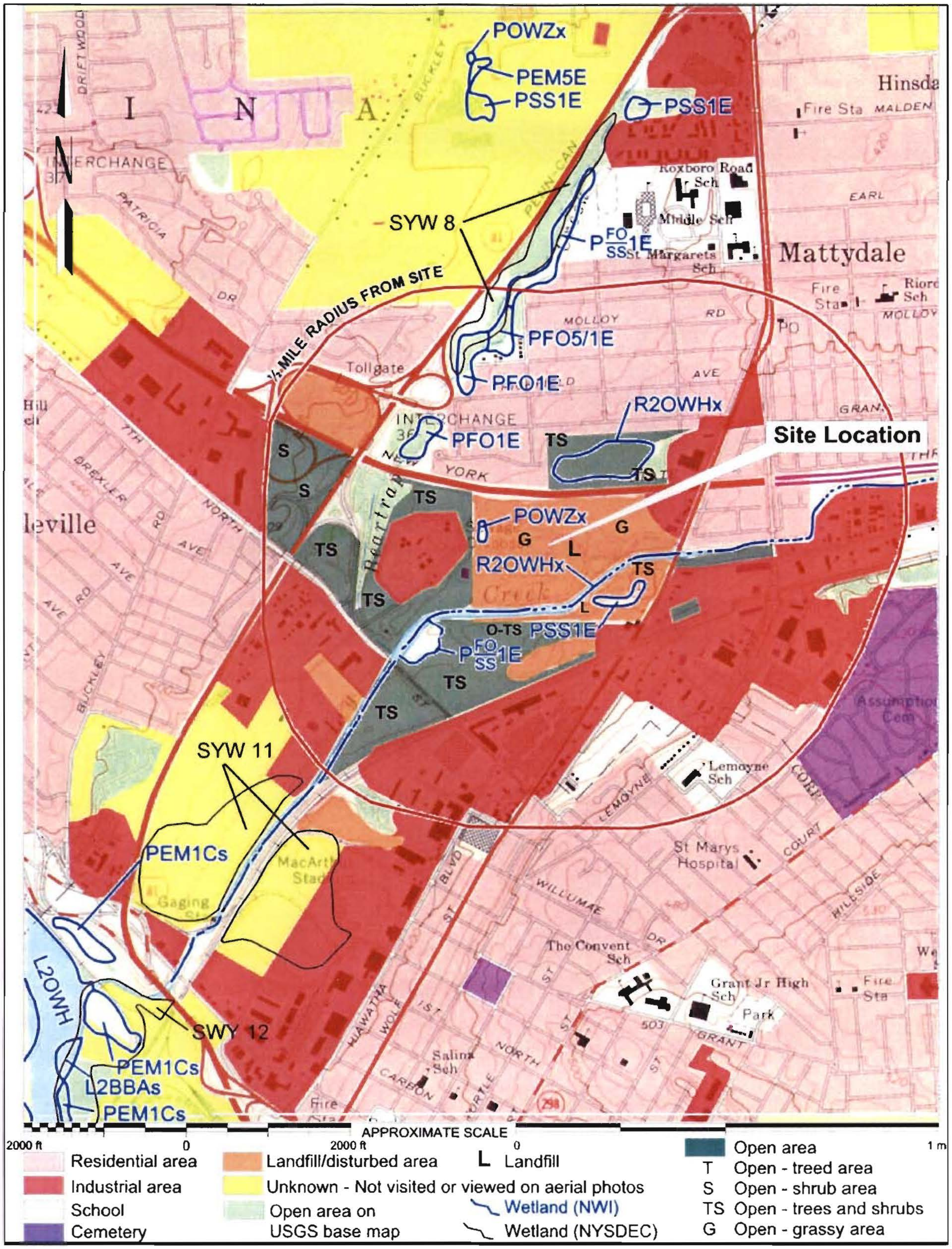

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FIGURE 3-6

NATURAL AREAS AND LAND USE IN THE VICINITY OF THE SITE

TOWN OF SALINA REMEDIAL INVESTIGATION

I:\6967\DRAWINGS\INVESTIGATION\ FIG3-6.DWG 05/11/00 3:10 PM JFT PLOT 1 TO 1

Biological or ecological communities present on or adjacent to the site are defined in Ecological Communities of New York State by Carol Reschke (Reschke 1990). The following 12 ecological communities, as defined by Reschke (1990), were observed during the July 1998 site survey. These ecological communities are outlined on the ecological community base map (Figure 3-5).

- Riverine System:

  - Natural Streams

    Midreach stream (MRS) - includes the natural streambed of Ley Creek.

    Backwater slough (BS) - includes remnant sections of Ley Creek or backwater of Ley Creek with quiet to stagnant waters.

  - Riverine Cultural

    Canal (C) - includes sections of Ley Creek where the channel was modified from its original course; however, the area is not precisely known and the creek is classed as a midreach stream.

    Ditch/artificial intermittent stream (AIS) - includes artificial waterways constructed for drainage.

- **Lacustrine System**

  - Lacustrine Cultural

    Sewage treatment pond (STP) - includes small pond to the west end of the property, which appears to be a widened and deepened part of a ditch/artificial intermittent stream.

- **Palustrine System**

  - Palustrine Cultural

    Reedgrass/purple loosestrife marsh (RM) - includes several small wetlands that have been created by disturbance and where the dominant vegetation is reedgrass (*Phragmites australis*) or purple loosestrife (*Lythrum salicaria*).

  - Open Mineral Soil Wetlands

    Shallow emergent marsh (SEM) - includes marshes along the edges of Ley Creek.

- **Terrestrial System**

  - Open Uplands

    Successional old field (SOF) - includes areas cleared or covered with capping soils where forbs and grasses occur. Generally shrubs can occur but have less than 50% coverage. Includes most of the higher landfill areas.

    Successional shrubland (SS) - includes areas where shrubs and small trees occur. Shrubs usually cover more than 50% of the area

    Successional southern hardwoods (SSH) includes deciduous forest located along the banks of Ley Creek

  - Terrestrial Cultural

    Landfill/dump (L) - includes the majority of the project area. Reschke (1990) defines a landfill as a site that has been cleared or excavated where garbage is disposed of. Vegetation includes herbs and shrubs.

    Mowed roadside (MR) - includes areas adjacent to the New York State Thruway that are intermittently mowed.

The following ecological communities make up a significant part of the site and adjacent areas and are therefore discussed in greater detail. Species expected to occur in the various ecological communities and species observed during the site survey on July 22 –24, 1998 are provided in Table 3-7. An assessment of the potential value of each community to wildlife is also provided.

Successional Hardwoods: a mixed hardwood forest that occurs on disturbed sites. This community is found along Ley Creek and along the southern and western edges of the landfill. Common trees include birch, box elder, elm, and maple mixed with introduced species including black locust and common buckthorn. Trees and shrubs produce seeds and berries that are eaten by a variety of birds and some mammals. This community provides food and cover for many wildlife species that are present or could occur on the site (see Table 3-7).

Successional Shrubland: a shrubland that occurs in disturbed areas. This community is found between the landfill and successional forests along Ley Creek. The area supports a variety of shrubs and shrubby trees including dogwood, raspberries, hawthorne, serviceberry, chokecherry, sumac, and others. Grasses and forbs occur between patches of shrubs. Several shrubs produce seeds and berries eaten by a variety of birds and some mammals. This community provides food and cover for many wildlife species that are present or could occur on the site (see Table 3-7).

Successional Old Field: an old field that occurs on disturbed land. This community is found on the main landfill cover and is the dominant ecological community on-site. Characteristic vegetation includes, Junegrass, orchard-grass, timothy, ryegrass, *Phragmites*, purple loosestrife, hedge mustard, teasel, goldenrod, chickory, birdfoot trefoil, milkweed, thistle, vetch, butter and eggs, and several others. Junegrass dominates with patches of orchard-grass, timothy, ryegrass, *Phragmites*, and purple loosestrife. This community provides food and cover for a variety of wildlife species that prefer open habitats. This habitat is valuable because grasslands/old fields are successional habitats that become shrublands and forests. Since grassland species of birds are declining because of habitat loss resulting from succession, this community has a high value for wildlife. Species expected to occur and species found are provided in Table 3-7.

Midreach Stream – "Natural Stream": the portions of Ley Creek within and adjacent to the Town of Salina Landfill provide a degraded habitat with little in-stream structure. Debris, logs, stumps, trees, and rocks provide some cover. Aquatic vegetation is very limited (probably as a result of foraging carp). There are areas of emergent marsh cattails, pickerelweed, arrowhead, and other emergents that provide valuable habitat. These are in and adjacent to Ley Creek.

TABLE 3-7
Common Ecological Communities - Fish and Wildlife Expected/Present
TOWN OF SALINA LANDFILL

Species	Special Habitat Needs	Successional Hardwoods		Successional Shrubland		Successional Old Field		Shallow Emergent Marsh		Natural Stream		AIS and Backwaters	
		Expected	Present	Expected	Present	Expected	Present	Expected	Present	Expected	Present	Expected	Present
FISH													
Common carp	Permanent Water									x	x		
Blacknose dace	Permanent Water									x	x	x	x
Fathead minnow	Permanent Water									x	x	x	x
Creek chub	Permanent Water									x	x		
White sucker	Permanent Water									x	x		
Brook stickleback	Permanent Water									x	x		
Pumpkinseed	Permanent Water									x	x		
Largemouth bass	Permanent Water									x			
Tessellated darter	Permanent Water									x	x		
Yellow perch	Permanent Water									x			
AMPHIBIANS													
Red-spotted newt	Aquatic sites	x		x								x	
Northern dusky salamander	Streams or seeps											x	
Northern redback salamander	Moist soil with cover	x								R		R	
Northern slimy salamander	Moist soil with cover	x											
Northern two-lined salamander	Streams									R		R	
Eastern American toad	Intermittent Pools	x		x		x							
Gray treefrog	Seeps and aquatic sites	x						x		R		R	
Northern spring peeper	Aquatic sites	x		x				x				x	
Bullfrog	Aquatic sites							x		x		x	
Green frog	Aquatic sites					x		x	x	x	x	x	
Northern leopard frog	Aquatic sites					x		x		x		x	
Pickerel frog	Aquatic sites					x		x		x		x	
Wood frog	Aquatic sites	x						x					
REPTILES													
Common snapping turtle	Aquatic sites							x	x	x	x	x	x
Common musk turtle	Aquatic sites							x				x	
Midland painted turtle	Aquatic sites							x		x	x	x	x
Northern water snake	Aquatic sites							x		x		x	
Northern brown snake	Terrestrial cover					x							
Northern redbelly snake	Terrestrial cover	x											
Common garter snake	Terrestrial cover			x		x							
Northern ringneck snake	Moist & Terrestrial Cover	x		x		x						R	
Eastern milk snake	Moist & Terrestrial Cover			x		x							

TABLE 3-7
Common Ecological Communities - Fish and Wildlife Expected/Present
TOWN OF SALINA LANDFILL

Species	Special Habitat Needs	Successional Hardwoods		Successional Shrubland		Successional Old Field		Shallow Emergent Marsh		Natural Stream		AIS and Backwaters	
		Expected	Present	Expected	Present	Expected	Present	Expected	Present	Expected	Present	Expected	Present
BIRDS													
Pied-billed grebe	Aquatic habitat							x		x			
Great blue heron	Aquatic habitat	R						x	x	x	x		
Green heron	Aquatic habitat	R						x		x	x		
American black duck	Wooded streams							W		W	ISV		
Mallard	Aquatic habitat	x						x		x	x		
Red-tailed hawk	Forest with clearings	x		x		x	x	x					
Common merganser	Open water									W	ISV		
Broad-winged hawk	Woodlands	x		x		x							
American kestrel	Open areas & perches			x		x							
Ring-necked pheasant	Open areas			x		x							
Ruffed grouse	Dense woods	x											
Wild Turkey	Open areas	x	x	x	x								
American crow		x	x	x	x	x	x						
Virginia rail	Emergent wetlands							x					
Killdeer						x							
Spotted sandpiper	Exposed shorelines									x	x		
Solitary sandpiper	Exposed shorelines									x	x		
American woodcock	Moist woods	x											
Rock Dove		x	x	x	x	x	x						
Morning dove		x	x	x	x	x	x						
Eastern screech-owl	Woodlots	x											
Great horned owl	Woodlots	x											
Common nighthawk				x		x							
Chimney swift	Chimneys-Forages in flight					x	x						
Belted kingfisher										R	x		
Ruby-throated hummingbird	Flowers	x	x										
Red-headed woodpecker	Woodlands	x											
Red-bellied woodpecker	Woodlands	x											
Downy woodpecker	Woodlands	x	x										
Hairy woodpecker	Woodlands	x											
Northern flicker	Woodlands & open areas	x	x	x		x	x						
Eastern wood-pewee	Woodlands & open areas	x											
Alder flycatcher	Shrublands & clearings			x									
Willow flycatcher	Trees/shrubs & clearings	x	x	x	x								
Least flycatcher	Woodland edges	x	x										
Eastern phoebe	Woodland & stream edges	x	x							R	x		
Great crested flycatcher	Woodland edges	x	x	x	x								
Eastern kingbird	Clearings			x	x	x	x			R			
Tree swallow	Open areas near water	x								R			
Barn swallow						x	x						
Blue jay		x		x									
Black-capped chickadee	Woodlands & openings	x	x										

TABLE 3-7
Common Ecological Communities - Fish and Wildlife Expected/Present
TOWN OF SALINA LANDFILL

Species	Special Habitat Needs	Successional Hardwoods Expected	Successional Hardwoods Present	Successional Shrubland Expected	Successional Shrubland Present	Successional Old Field Expected	Successional Old Field Present	Shallow Emergent Marsh Expected	Shallow Emergent Marsh Present	Natural Stream Expected	Natural Stream Present	AIS and Backwaters Expected	AIS and Backwaters Present
Tufted titmouse	Woodlands	x								R			
White-breasted nuthatch	Woodlands	x											
Brown creeper	Woodlands	x											
House wren	Trees & shrubs	x	x	x	x								
Carolina wren	Thick bushy areas	x		x									
Veery	Moist woodlands	x								R			
Wood thrush	Moist woodlands	x											
American robin	Thick bushy areas & openings	x	x	x	x	x	x						
Gray catbird	Thick bushy areas & openings	x	x	x	x								
Northern mockingbird	Thick bushy areas & openings			x									
Eastern bluebird	Open areas w/ trees	x		x		x							
Brown thrasher	Woodland edges	x		x		x							
Cedar waxwing	Open areas w/ trees & shrubs	x	x	x	x	x							
European starling		x	x	x	x	x	x						
Warbling vireo		x											
Red-eyed vireo		x											
White-eyed vireo	Shrublands			x									
Blue-winged warbler	Open areas w/ trees & shrubs	x		x									
Yellow warbler	Thick vegetation near water	x	x	x	x			x		R			
Chestnut-sided warbler	Woodland edges			x									
Black and white warbler		x											
American redstart		x											
Common yellowthroat		x	x	x	x			x	x	R	x		
Hooded warbler	Dense understory	x											
Scarlet Tanager	Thickets & vines	x											
Northern cardinal	Thickets & vines	x	x	x									
Rose-breasted grosbeak	Woodland edges	x		x		x							
Indigo bunting	Woodland edges					x							
Rufous-sided towhee	Bushy understory	x		x		x							
American tree sparrow	Open weedy fields					W							
Field sparrow	Old fields					x							
Song sparrow		x	x	x	x	x	x				x		
White-throated sparrow				W		W							
Dark-eyed junco	Woodland edges			W		W							
Bobolink	Open fields					x							
Red-winged blackbird	Grasslands & marshes		x		x	x	x	x	x		x		
Eastern meadowlark	Open fields					x	x						
Common grackle	Wet open areas	x	x	x	x					R	x		
Brown-headed cowbird				x	x	x	x						
Baltimore oriole	Woodland edges	x	x	x		x	x						
House finch		x	x	x	x	x							
American goldfinch	Open weedy fields	x	x	x	x	x	x				x		
House sparrow						x	x						

TABLE 3-7
Common Ecological Communities - Fish and Wildlife Expected/Present
TOWN OF SALINA LANDFILL

Species	Special Habitat Needs	Successional Hardwoods		Successional Shrubland		Successional Old Field		Shallow Emergent Marsh		Natural Stream		AIS and Backwaters	
		Expected	Present	Expected	Present	Expected	Present	Expected	Present	Expected	Present	Expected	Present
MAMMALS													
Virginia opossum	Log or tree cavity	x											
Masked shrew	Moist woodlands w/ grnd cover	x											
Northern shorttail shrew	Ground cover			x	x	x	x						
Eastern mole	Soft moist soils w/ earthworms	x		x		x							
Eastern Cottontail	Brushy fields	x		x	x	x	x						
Eastern Chipmunk	Woodland edges	x											
Woodchuck	Open fields & woodland edges	x	x	x		x							
Gray squirrel	Woodlands	x											
White-footed mouse		x	x	x	x								
Southern redback vole	Moist areas w/ grnd cover	x											
Meadow vole	Herbaceous vegetation					x							
Muskrat								x			x	x	
Meadow jumping mouse	Herbaceous vegetation					x							
Red fox		x		x	x	x	x						
Gray fox	Hollow logs or tree cavities	x		x	x								
Raccoon	Hollow logs or tree cavities	x								R	x		
Longtail weasel		x		x									
Mink	Hollow logs or tree cavities near water	x											
Striped skunk													
Whitetail deer		x	x	x	x	x	x	x	x	R	x		

AIS - Artificial Intermittent Stream.
X - Expected or present.
R - Riparian.
W - Expected winter resident.
ISV - Present during initial site visit.

The benthic substrate (generally silt and sand with some gravel) provides habitat for a variety of invertebrates including benthic worms (mostly oligochaetes), aquatic insect larvae (e.g., chironomids), amphipods, bivalves, and gastropods. These invertebrates feed on phytoplankton, zooplankton, and detritus in the water and are in turn fed upon by fish, larger invertebrates, shorebirds (e.g., sandpipers) and other wildlife. Fish utilizing this habitat for food and cover include common carp, dace, minnows, creekchubs, white suckers, sticklebacks, pumpkinseeds, and tessellated darters. The presence of fish provides foraging for several species of fish-eating birds including belted kingfishers, great blue herons, and mergansers. Predatory fish, including bass and pickerel, were not observed. The banks and emergent marsh provide habitat (cover, homes, and food) for muskrat.

Midland painted turtles (MPT) find habitat for food and cover in and adjacent to Ley Creek. Amphibians (green frogs) use habitat along the creek banks and in adjacent marshes feeding on invertebrates including aquatic insects. These and other species expected to occur or are present in this community are listed in Table 3-7.

Shallow Emergent Marsh: These communities occur along Ley Creek and the drainage ditches on the northern and western borders of the landfill as a narrow strip. Along Ley Creek, the dominant vegetation consists of cattails, arrowshead, burweed, pickerel weed, and some *Phragmites* patches. These marshes provide food and shelter for muskrats, and the drier sections provide habitat for meadow voles. Green frogs occur in these marshes, as do other frogs and snakes and red-winged blackbirds; swamp sparrows, marsh wrens, and rails should also be present. Muskrat and meadow voles feed on vegetation including cattails. Reptiles and birds feed on variety of invertebrates present in this community. Species expected to occur and species present in this community are listed in Table 3-7.

Ditch/artificial intermittent stream: Ditch/artificial intermittent streams occur as drainage areas between the New York State Thruway (Route 90) and the northern border of the landfill. They also occur along the western border of the landfill and as a drainage ditch bisecting the northeastern section of the landfill, where the open ditch is directed underground through a 48-inch diameter pipe. The sediments in these ditches are soft mud, and the water depth is generally a few inches. Aquatic vegetation, including duckweed and several emergents, occur at the edges and adjacent to the ditches.

Fish, mostly dace, utilize this habitat, which may dry up during drought years causing high mortality of fish. During wet years, the ditches may be partially flooded from high waters of Ley

Creek, allowing fish to reestablish there. The ditches and adjacent emergent marsh could also potentially provide habitat for turtles, snakes, and frogs. However, none were observed there, possibly due to difficulty in traveling along the ditches. The ditches may also provide potential habitat for aquatic invertebrates and insects.

One section of this habitat has been deepened and enlarged to form a pond at the western edge of the landfill. This pond may provide a refuge for fish to survive dry periods, and may also provide good habitat for turtles and frogs, although none were observed. Species expected to occur and species present in this community are listed in Table 3-7.

Backwater Slough: A backwater slough occurs in the upper section of the old Ley creek channel which was cut off from Ley creek. This slough is a shallow, slow-moving water course with soft sediments and a dense growth of duck weed. This community was searched extensively for amphibians and reptiles, specifically water snakes, green frogs, painted turtles, and snapping turtles. Several painted turtles were found; however, no other amphibians and reptiles were seen. Species expected to occur and species present in this community are listed in Table 3-7.

3.3.3 Value of Resources to Humans

In general, the value to humans of the communities described above is minimal due to limited access to the site (private property) and because other more suitable areas for outdoor recreation occur nearby. Few people are expected to trespass on the property to engage in hunting, fishing, birding, hiking, or other outdoor activities. It is possible to navigate Ley Creek by small boat or canoe, which would provide glimpses of wildlife as well as scenic marshes in an industrialized area.

Fish utilize Ley Creek habitats and may migrate along the creek into Onondaga Lake. Fish may be caught and consumed by humans along the creek or in Onondaga Lake, although there are advisories against fish consumption in this area. Fishing for carp and other species may occur, although there was no evidence (e.g., trails to water, fishing line, and worn banks). Game birds and mammals may move long distances from the site to areas where they may be harvested through hunting.

3.3.4 Evidence of Environmental Stress

The site was qualitatively evaluated for evidence of environmental stress. Any adverse effects on ecological receptors including plant and animal populations and communities, habitats, and sensitive environments provide indications of environmental stress. Evidence of adverse effects include impaired reproduction, growth, and survival of populations; changes in community structure and function (species, numbers, biomass, relative abundance, etc.); and absence of common species expected to occur in available habitats. These indicators are used qualitatively to determine if the site is impaired.

Although there was no indication of stress to vegetation in uplands or wetlands at the site, the wildlife of the site may be impoverished. Suitable habitat exists for reptiles and amphibians along Ley Creek and on the landfill; however, green frogs were the only amphibians identified on-site in wetland areas along Ley Creek and the old Ley Creek channel. One reptile, the midland painted turtle, was observed and one snapping turtle was identified indirectly (eggs found). No snakes were observed on the site. The small mammal population also was impoverished. For example, despite areas of rank growths of grasses, the meadow vole population appeared low. Similarly, few signs (runways, cuttings, and burrows) of other small mammals were observed.

The macroinvertebrate samples indicate that there is some stream impairment occurring adjacent to and downstream of the landfill as evidenced by the impoverished macroinvertebrate community. Oligochaetes and Chironomids, both having many representatives that are highly tolerant of pollution, were common in the samples. Less tolerant groups, such as Ephemeroptera, were lacking both upstream and downstream. Bivalves and gastropods were present as live individuals only in the upstream sample. However, the lack of replicate samples and differences in analysis techniques makes it difficult to draw conclusions with complete confidence.

The macroinvertebrate samples did not show any obvious evidence of stream impairment along the sections of Ley Creek sampled.

No evidence of any contamination (odors, sheens, leachate trails, stained sediments) was observed on the landfill. Two surface water drainage courses were located on the landfill; both drain into Ley Creek. Leachate trails, sheens, and stained soils/sediments were observed in a few areas along Ley Creek (Photographs 7 through 9, Appendix A-3); these areas were identified and their locations were surveyed by CHA. The wetlands and shallow portions of the backwaters along Ley Creek had a dense healthy growth of several species of aquatic and emergent plants. The wetland strip along the Thruway also had a healthy growth of emergent and floating vegetation, as well as small fish. There were few areas where landfill materials were visible; debris was visible in some areas along the old Ley Creek channel and in a few areas on the landfill itself. However, for the most part, debris remained covered on the landfill.

3.4 RESULTS OF WASTE AREA INVESTIGATIONS

3.4.1 Limit of Waste

As described in Section 2, the limit of waste at the landfill was determined through excavation of numerous test pits and trenches. Based upon the results of this work, the limit of waste is depicted in Figure 3-7. The northern limit of waste is close to the Buckeye Petroleum pipeline that parallels the Thruway. The southern limit of waste essentially borders on the original channel for Ley Creek. The western limit of waste is close to the border between Town of Salina property and property owned by OCRRA, although waste clearly encroaches onto OCRRA's property in the northwest corner of the site. The eastern boundary of the waste extends close to the western boundary of the commercial properties located along Route 11. The area of the landfill, based on this work, is ± 53 acres.

It is important to note that waste exists on property owned by East Plaza, Inc. on the parcel located between old Ley Creek and the current Ley Creek channel. Based on review of historical aerial photographs, it appears that at least some of the waste was placed on this parcel before Ley Creek was moved in the early 1970s. To determine if waste is present beneath the bed of Ley Creek, two soil borings (B-21 and B-22) were drilled in the middle of Ley Creek. No waste was found in either boring. A till material was found at relatively shallow depths in each boring. It is presumed that if the new channel was excavated through waste, that the waste was moved.

3.4.2 Description of Waste Materials

The waste consisted of typical municipal solid waste (MSW) including cans, glass bottles, paper, plastic, and clothing; construction and demolition debris such as concrete, lumber, reinforcing rod, and bricks; commercial solid wastes such as scrap metal, automotive parts, and tires. A variety of yard wastes (e.g. stumps, leaves, and logs) was also found within the waste profile. A black oily sludge with a petroleum odor was found in many of the test pits dug around the

perimeter of the landfill. This material was absent in the area south of Ley Creek and in the northeast corner of the landfill. CHA attempted to determine the extent of this material along the north bank of Ley Creek, but the material does not appear to exist as a continuous deposit. The northeast corner of the landfill was also absent of MSW and contained mostly construction and demolition debris. A description of the contaminants present in subsurface soils is contained in Section 4.

3.4.3 Nature of Soil Cover

A soil cover approximately 2 feet in thickness was encountered over the majority of the site. The soil cover directly overlies waste materials. The soil cover is thin to absent in the area located between the property owned by Niagara Mohawk and the north bank of Ley Creek. It is also thin to absent along the southern edge of the parcel owned by East Plaza, Inc. located between old Ley Creek and the main channel of Ley Creek.

Four Shelby Tubes were collected from the landfill to determine the permeability of the soil cover. Only two of the samples could be tested due to the dry nature of the soil. The results of that testing indicated that the soil cover has a relatively low permeability with values of 9.46×10^{-8} cm/sec and 9.32×10^{-5} cm/sec.

3.4.4 Distribution of Methane Gas

Methane soil gas readings were collected at 104 points around the perimeter and across the top of the landfill. The survey points were located every 100 feet around the perimeter of the landfill and on a 200-foot grid over the top of the landfill. Figure 3-8 shows the results of the survey. Methane gas was only detected at 12 points. The locations of these 12 points are spread over the landfill and there are no concentrated areas of methane within the landfill. The highest reading of methane was 20 %, detected on the north side of the landfill. No methane gas was detected at any survey points surrounding this reading. Elevated concentrations of methane (13% and 16%) were detected at two other survey points, but again, these points were surrounded by survey points where no methane was detected. Based on these results, it does not appear that the landfill is actively producing methane to any significant extent.

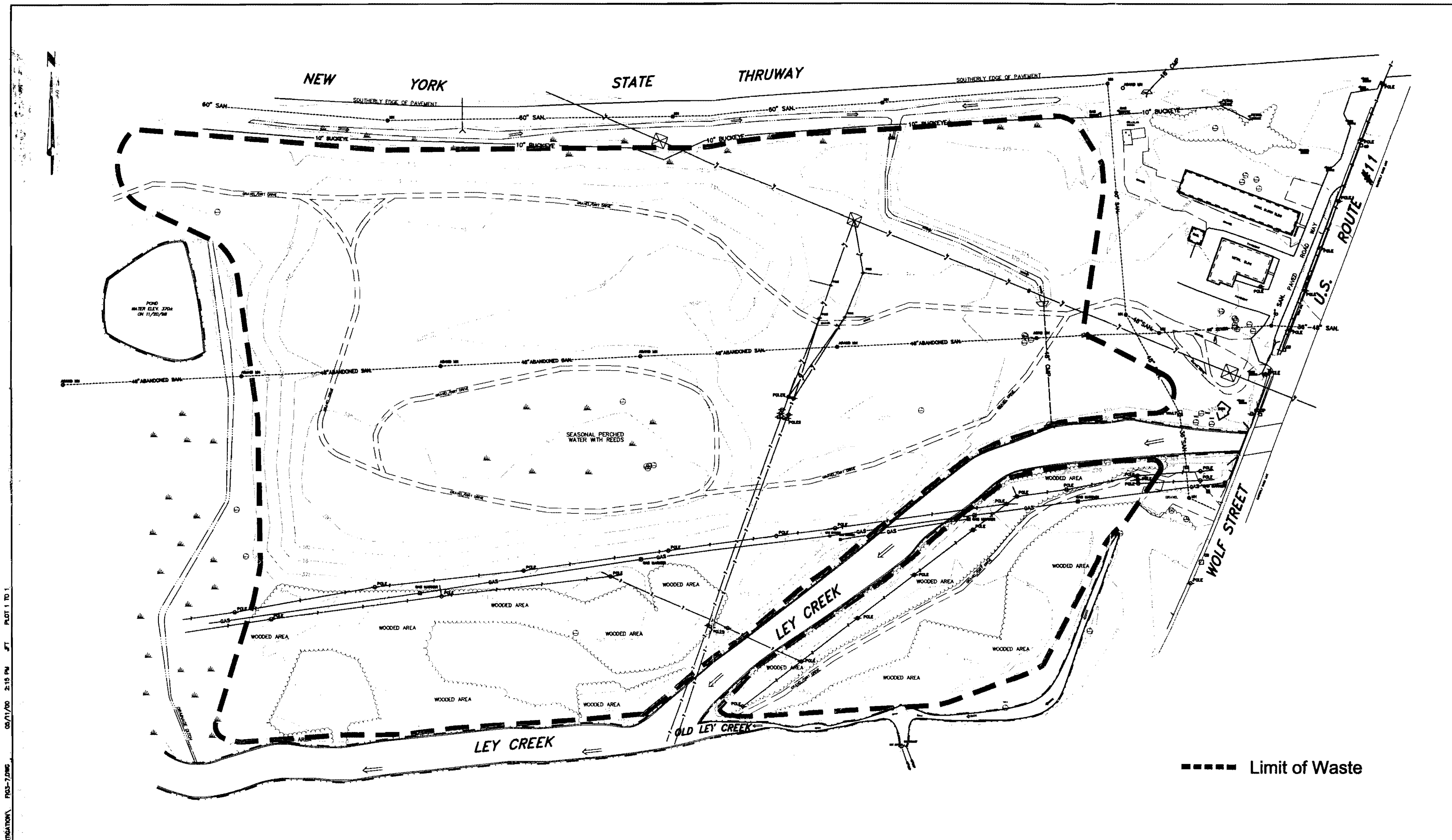

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FIGURE 3-7
LIMIT OF WASTE
TOWN OF SALINA LANDFILL RI/FS

I:\8832\DRAWINGS\REMEDIAL INVESTIGATION\ FIG3-7.DWG 05/11/00 2:15 PM JFT PLOT 1 TO 1

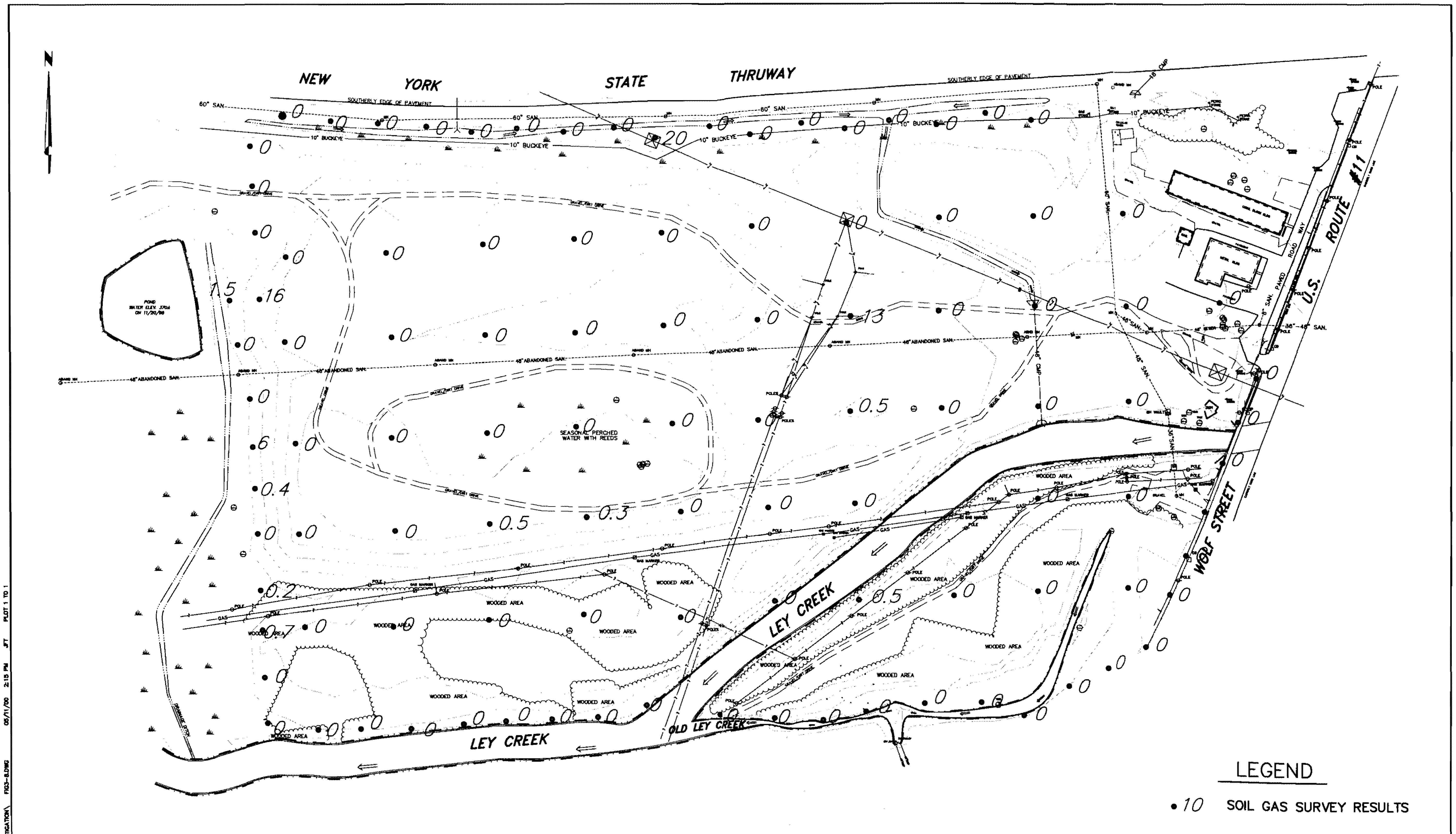
3.5 SITE SETTING

3.5.1 Site Stratigraphy

Soil classifications and drilling details are provided in the boring logs included in Appendix B-4. The stratigraphy of the site has been defined through evaluation of soil samples collected during the drilling and installation of eight shallow wells ranging from 18 to 34 feet deep, three deep wells ranging from 40-50 feet deep, and four deep borings ranging from 70-80 feet deep (Figure 2-5). CHA has compiled several cross-sections through the site (locations marked on Figure 2-5). It should be noted that some generalizations in the materials encountered were necessary to construct the cross-sections. The test pit data was not typically included in the development of the cross-sections because they were relatively shallow compared to the borings and not considered to have as high or accuracy of the borings. The exception was that two test pits (TP-27 and TP-40) were included on cross-section C-C' to show the waste along the banks of Ley Creek. The uppermost soils encountered over most of the site consist of silt and clay and represent the soil cover placed over the waste in the 1980s. This uppermost layer is approximately 2 feet thick. The soil cover overlies landfilled waste. The waste is thickest on the western portion of the site and thins to the east. Across the western portion of the landfill, the waste overlies a layer of clay varying in thickness from 6 to 40 feet (Figure 3-9). A discontinuous layer of sand appears between the waste and clay layer along the southern and eastern portions of the site (Figure 3-10). A silt and sand unit up to 20 feet thick underlies this clay layer over most of the site. This silt and sand unit overlies a sand unit up to 25-feet thick that appears to dip slightly to the west. A dense glacial till is present beneath the sand unit. A cross-section from south to north through the site (Figure 3-11) shows that the landfill appears to lie in a trough, as the till is found within 10 feet of the surface on the south side of Ley Creek, but is approximately 60 feet below grade in boring B-11.

3.5.2 Site Hydrogeology

Groundwater on site is found in two water-bearing units on site. The uppermost water-bearing unit is unconfined. The water table present ranging from 4 to 22 feet below grade and is present either within the waste, or in the uppermost sand unit. The lower water-bearing unit is under confined conditions and is present in the lower sand unit, above the till. In fact, the conditions were such that well MW-12D, screened in the lower sand unit, was a free-flowing artesian well. Table 3-8 summarizes groundwater elevation data collected on three separate occasions. A groundwater piezometric map, constructed for the water table aquifer from data collected



GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 200 ft.

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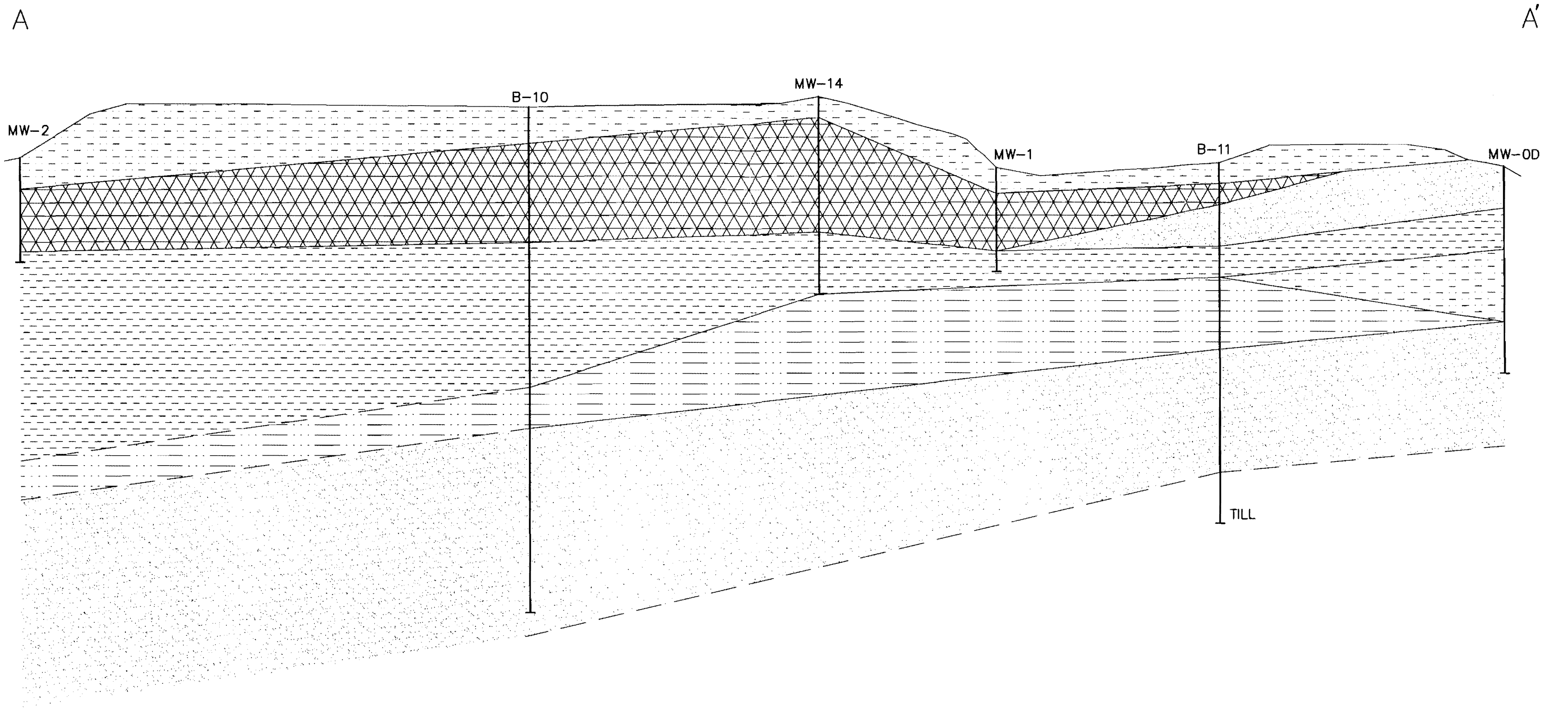
FIGURE 3-8

SOIL GAS SURVEY RESULTS

TOWN OF SALINA LANDFILL RI/FS



SCALE

HORIZONTAL: 1"=120'

VERTICAL: 1"=20'

LEGEND

SAND

SILT AND CLAY

SAND AND SILT

CLAY

DEBRIS/WASTE

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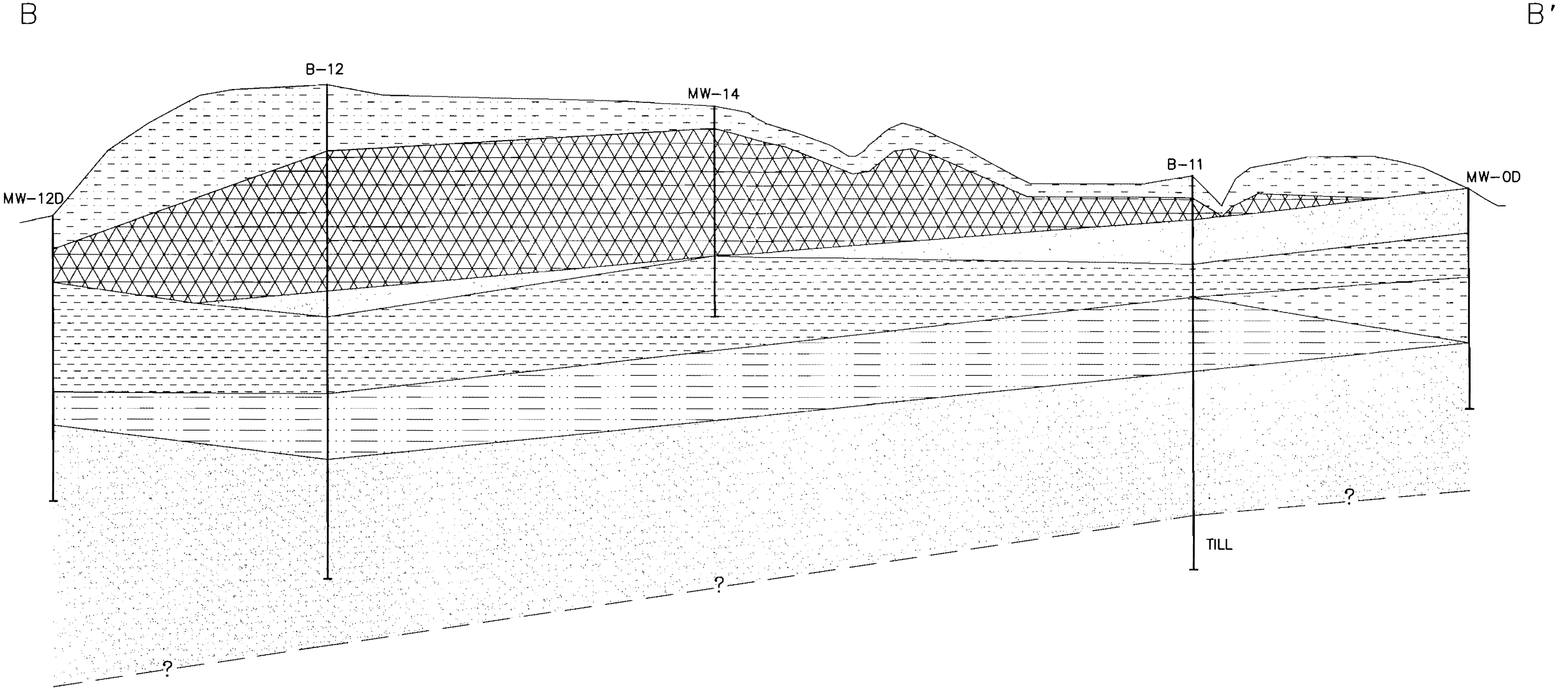
FIGURE 3-9

GEOLOGIC CROSS-SECTION A-A'

TOWN OF SALINA LANDFILL RI/FS



SCALE

HORIZONTAL: 1"=150'

VERTICAL: 1"=20'

LEGEND

SAND
SILT AND CLAY
SAND AND SILT
CLAY
DEBRIS/WASTE

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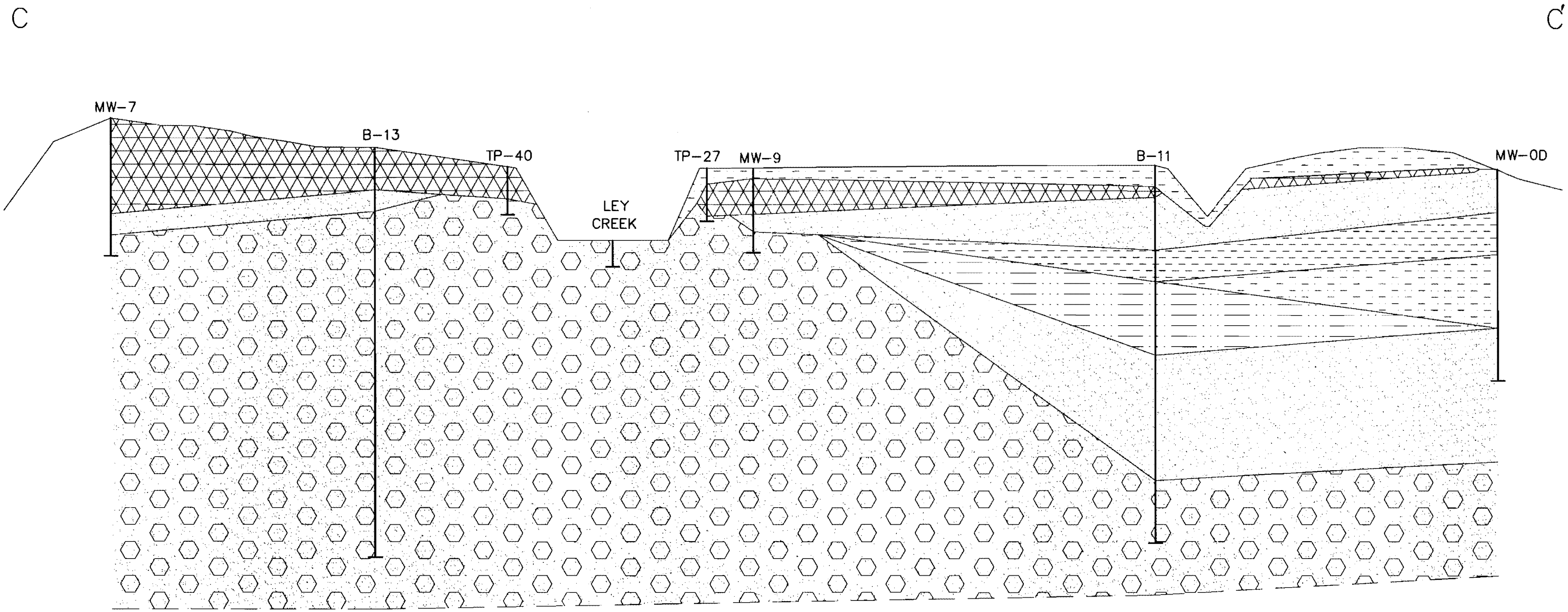
FIGURE 3-10
GEOLOGIC CROSS-SECTION B-B'
TOWN OF SALINA LANDFILL RI/FS

t:\6832\DRAWINGS\REMEDIAL INVESTIGATION\ FIG3-10.DWG 08/11/00 2:15 PM JFT PLOT 1 TO 1



SCALE

HORIZONTAL: 1"=80'

VERTICAL: 1"=20'

LEGEND

SAND	SILT AND CLAY
SAND AND SILT	CLAY
DEBRIS/WASTE	TILL

CLOUGH, HARBOUR & ASSOCIATES LLP
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FIGURE 3–11
GEOLOGIC CROSS-SECTION C-C'

TOWN OF SALINA LANDFILL RI/FS

TABLE 3-8
TOWN OF SALINA LANDFILL
GROUNDWATER ELEVATION DATA

Monitoring Point	Northing Coordinate	Easting Coordinate	Top of PVC Elev. (ft)	GW Elev. (ft) 8/13/98	GW Elev. (ft) 8/28/98	GW Elev. (ft) 10/28/98
MW-0	1126701	935658	375.63	368.79	369.80	369.21
MW-1	1126629	935114	376.47	369.40	369.96	369.69
MW-2	1126661	933979	378.98	369.88	369.96	369.98
MW-3	1126167	933948	372.23	367.85	368.37	368.11
MW-4	1125454	933975	371.06	364.64	364.95	364.75
MW-5	1125493	934744	371.99	364.60	364.86	364.77
MW-6	1125487	935014	377.19	362.92	363.39	363.09
MW-7	1125618	935560	387.32	365.28	365.96	367.07
MW-8	1125914	935702	376.05	367.41	366.86	366.68
MW-9	1126140	935745	374.21	364.46	364.98	364.77
MW-10	1125904	935269	382.21	366.06	366.40	365.98
MW-12	1125759	933961	371.31	366.70	366.84	366.78
MW-14	1126490	934916	389.87	357.29	369.30	367.48
MW-15	1125914	934878	390.89	370.58	370.67	370.70
WP-1	1125443	933900	369.00	364.75	364.90	364.78
WP-2	1125468	934143	375.24	365.80	366.02	365.89
WP-3	1125467	934254	374.70	366.15	366.30	366.26
WP-4	1125471	934366	373.95	366.71	366.83	366.78
WP-5	1125749	935075	385.05	366.64	366.77	366.73
WP-6	1126063	935488	377.83	361.43	363.67	363.65
WP-7	1126139	935812	373.67	364.53	364.71	364.51
MW-0D	1126686	935659	376.69	370.93	371.07	370.98
MW-5D	1125509	934743	375.52	366.92	367.06	366.97
MW-12D*	1125770	933964	373.01		371.66	371.60

*PVC riser extension is 3.60 ft.

8/28/98, shows that groundwater is mounded within the waste and flows either to the southeast or to the southwest, discharging to Ley Creek (Figure 3-12). The piezometric map was constructed using Surfer. Note that there appears to be a low-point in the water table surface centered around WP-6 and MW-9. Data collected on several occasions in both wells is internally consistent indicating this feature is real. CHA speculates that the 48-inch corrugated metal pipe in the vicinity of these monitoring points may be acting as a drain in this area and therefore lowering the water table.

Groundwater elevation data for the confined aquifer appears to show a gradient to the southeast. However, it was expected that groundwater in the confined aquifer would flow to the southwest, toward Onondaga Lake. Flow to the southeast seems unreasonable as the sand unit pinches out against shallow till in the southeastern portion of the site (see cross section C-C'). The data may be suspect, given that MW-12D required an extension to the well to be able to measure the depth to groundwater. Based on chemical data presented later in the report that shows this lower confined aquifer has not been impacted by site contaminants, a detailed analysis of flow direction in the lower aquifer does not Slug tests were performed for all the newly installed wells, with the exception of well MW-12D (no test could be performed because it was free flowing). The results of the slug tests are summarized in Table 3-9. The hydraulic conductivity for the water table aquifer ranges between 1.07 x 10^{-2} to 9.84 x 10^{-3} cm/sec. The hydraulic conductivity for the deeper confined aquifer is approximately 1 x 10^{-1} cm/sec.

Darcy's Law was used to calculate groundwater flow velocities in both aquifers according to the formula:

$$v = (k * i)/n_e$$

where v = velocity
k = hydraulic conductivity
i = hydraulic gradient
and n_e = effective porosity

The hydraulic conductivity value used for the unconfined aquifer was 1.12 x 10^{-2} cm/sec (31.75 ft/day). The hydraulic gradient measured on site varies according to location, but the steepest gradient of 0.012 ft/ft (exhibited between wells MW-15 and MW-10) was used in the calculation. Because the water table lies within waste or the upper sand unit, a value of 40% was used as the estimated effective porosity. Based on these values, the groundwater flow velocity is estimated to be 0.95 ft/day or 347 ft/year.

TABLE 3-9
TOWN OF SALINA LANDFILL
SUMMARY OF HYDRAULIC CONDUCITIVITY TESTS

	Hydraulic Conductivity (cm/sec)		
Well No.	Falling Head Test	Rising Head Test	Geometric Mean
MW-0D	1.07E-01	1.18E-01	1.12E-01
MW-5D	1.41E-01	1.32E-01	1.36E-01
MW-6*	2.23E-03	9.06E-03	4.49E-03
MW-7*	3.96E-02	2.91E-02	3.40E-02
MW-8*	3.68E-03	2.23E-03	2.87E-03
MW-9	3.92E-02	6.35E-03	1.58E-02
MW-10*	3.26E-03	1.25E-02	6.38E-03
MW-12	9.46E-03	1.02E-02	9.84E-03
MW-14	4.83E-02	2.37E-03	1.07E-02
MW-15	5.00E-02	5.84E-02	5.40E-02

Geometric Mean for Confined Wells = 1.24E-01
Geometric Mean for Unconfined Wells = 1.12E-02

* Data analyzed using solution for both confined and unconfined aquifers.
Results for unconfined aquifer presented in table.
Results using solution for confined aquifer are approximately agree within a factor of five.

The hydraulic conductivity value used for the confined aquifer was 1.24×10^{-1} cm/sec (351.5 ft/day). The hydraulic gradient measured between MW-12D and MW-5D is 7.7×10^{-3} ft/ft. Because the aquifer consists of medium to coarse sand, a value of 25% was used as the estimated effective porosity. Based on these values, the groundwater flow velocity is estimated to be 10.7 ft/day or 3,932 ft/year.

4.0 CONTAMINANT DISTRIBUTION

Samples of groundwater, surface water, sediment, leachate, surface soil, and subsurface soil and biota were collected during the investigation. The data for each media are presented and discussed below. In each case, the data have been compared to the appropriate regulatory standard or guidance value for specific organic compounds and metals. If background samples were collected for a specific media, data from various sampling points are also compared to background values.

4.1 GROUNDWATER

In the Phase I Investigation, groundwater samples were collected from a total of seventeen permanent monitoring wells on site, including six existing shallow wells, eight new shallow wells and three new deep wells. The data for the permanent wells have been reduced to reflect only compounds/metals that were detected in the groundwater and are presented in Table 4-1. In the Phase II Investigation, wells MW-0 and MW-10 were resampled to confirm results obtained in the first round of sampling. Additionally, these wells were sampled for dioxin congeners. The results of the conventional parameters are included in Table 4-1. The results of the dioxin sampling are summarized in Table 4-2. In the Phase I Investigation, samples were also collected from the 7 temporary well points during the first round of sampling. Data from this sampling effort is presented in Table 4-3.

Well MW-0 has been designated as the background well for the water table aquifer and well MW-0D is the designated background well for the deeper confined aquifer. Data have been compared to Class GA groundwater standards and Guidance Values as presented in the TOGS 1.1.1 (June 1998).

The data shows that, in general, the majority of the groundwater in the water table aquifer is relatively free of organic compounds (Figure 4-1). The area of the site that appears to be most heavily impacted is the southeast portion of the landfill. Well MW-10 is the most heavily contaminated well with elevated concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) as well as elevated concentrations of chlorinated solvents such as trichloroethene (TCE), 1,2-dichloroethene (1,2-DCE), 1,1,1-trichloroethane, tetrachloroethane and vinyl chloride. The results from the second round of sampling are very similar to those from the first round of sampling. Other wells in the vicinity of MW-10 including MW-6, MW-7, MW-8 and MW-9 contain a number of volatile organic compounds that exceed water quality standards or guidance

TABLE 4-1
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER

Sample ID / Lab Sample Number / Sampling Date	Units	TOGS 1.1.1 Standard or Guidance Value[1]	MW-0 [2] A8340501 08/18/98	MW-0 [2] 23199073 09/23/99	MW-0D [2] A8338501 08/17/98	MW-1 A8349801 08/24/98	MW-2 A8349804 08/24/98	MW-3 A8352701 08/25/98	MW-4 A8349806 08/24/98	MW-5 A8349805 08/24/98	MW-5D A8346002 08/20/98	MW-6 A8340301 08/18/98	MW-7 A8343201 08/19/98	MW-8 A8340302 08/18/98	MW-9 A8340502 08/18/98	MW-10 A8349901 08/24/98	MW-10 23199074 09/23/99	MW-12 A8352702 08/25/98	MW-12D A8352703 08/25/98	MW-14 A8349802 08/24/98	MW-15 A8348201 08/21/98
TCL Volatile Organics																					
1,1,1-Trichloroethane	ug/l	5		NA								4 J	6 J			2,822 D	2800 DJ				
1,1-Dichloroethane	ug/l	5		NA											3 J	704 EJ	570 EG				
1,1-Dichloroethene	ug/l	5		NA												259 EJ	360 EG				
1,2-Dichloroethene (total)	ug/l	5		NA								83	206		12	26,742 D	38011 DG				
Acetone	ug/l	50	40	NA												3,100 EJ					
Benzene	ug/l	1		NA		4 J								3 J		25	29 G				
Chlorobenzene	ug/l	5	1 J	NA		9 J								23		3 J	3 J	4 J			
Chloroethane	ug/l	5		NA				94								136	47	9 J			
Chloromethane	ug/l	-		NA													47 G				7 J
Ethylbenzene	ug/l	5		NA												1,700 DJ	3100 DJ				
Methylene Chloride	ug/l	5		NA												52					
Styrene	ug/l	5		NA												209 EJ					
Tetrachloroethene	ug/l	5		NA												75	6 G				
Toluene	ug/l	5		NA											7 J	92,774 BD	61000 DG				
trans-1,3-Dichloropropene	ug/l	0.4		NA																	125
Trichloroethene	ug/l	5		NA									6 J			11,138 D	570 EG			2 J	
Vinyl Chloride	ug/l	2		NA											107	1,059 EJ	740 EG				
Xylene (total)	ug/l	5		NA		12								2 J		11,394 D	17900 DJ			1 J	8 J
TCL Semivolatile Organics																					
1,2-Dichlorobenzene	ug/l	3		NA												4 J	5 J				4 J
1,4-Dichlorobenzene	ug/l	3		NA		2 J								5 J		10	9 J				4 J
2,4-Dimethylphenol	ug/l	50		NA												20	20 G				
2-Chloronaphthalene	ug/l	10		NA				2 J													
2-Methylnaphthalene	ug/l	-		NA										6 J		4 J	9 J				2 J
2-Methylphenol	ug/l	-		NA												184 D	78 G				
4-Methylphenol	ug/l	-		NA												184 D	130 D			2 J	
Bis(2-Ethylhexyl)phthalate	ug/l	5		NA								2 J	1 J		17					3 J	
Butylbenzylphthalate	ug/l	50	1 J	NA									5 J	2 J	5 J						5 J
Diethylphthalate	ug/l	50		NA												14	16 G			4 J	1 J
Di-n-Butylphthalate	ug/l	50	2 J	NA												1 J	10 G				
Fluorene	ug/l	50		NA																	1 J
Naphthalene	ug/l	10		NA		3 J								3 J		25	36 G				1 J
Phenanthrene	ug/l	50		NA																	1 J
Phenol	ug/l	1		NA												6 J					
Pesticides & PCBs																					
4,4'-DDT	ug/l	0.2		NA				0.015 JP													
Aldrin	ug/l	ND		NA												0.011 JP		0.0098 JP			
BHC-alpha	ug/l	0.01		NA												0.014 JP		0.0033 JP			
Endrin	ug/l	ND		NA									0.0025 J								
Heptachlor	ug/l	0.04		NA									0.0016 JP								
Methoxychlor	ug/l	35	0.031 JP	NA			0.015 JP	0.012 JP					0.016 JP	0.055 JP		0.028 JP					
Aroclor-1248	ug/l	0.09		NA		0.18 JP				0.27 JP		1		1.6	0.43 JP						0.98
Total Metals Analyses																					
Aluminum	ug/l	2000	3551	3890	116 B	192 B	67 B	174 B	196 B	2516	111 B	32444	182 B	1316	5440	57 B	23300	332	149 B	825	687
Antimony	ug/l	3												9 B							
Arsenic	ug/l	25	12.0					7.4 B	5.0 B	14.2	11.4	73.6			40.1	10.1		5.3 B			5.2 B
Barium	ug/l	1000	541.3 ENJ	493.0	29.4 EJ	403.3 ENJ	324.0 ENJ	849.3	528.8 ENJ	95.7 ENJ	29.9 ENJ	291.4 ENJ	638.6 ENJ	286.5 ENJ	91.6 ENJ	1687.3	802.0	691.8	73.7 B	285.5 ENJ	670.1 ENJ
Beryllium	ug/l	3										1.72 B									
Cadmium	ug/l	5	23.3			34.0	12.3	24.4	11.7	7.0	1.4 B	33.1	6.1	10.4	10.3	0.5 B		9.2		2.8 B	31.4
Calcium	ug/l	-	208860 NJ	222000	230360	151700 NJ	134640 NJ	146380	211180 NJ	341100 NJ	264050 NJ	322230 NJ	139690 NJ	122060 NJ	205580 NJ	631820	321000	195540	123540	126040 NJ	166180 NJ
Chromium	ug/l	50	12.7	25.8		5.0 B	2.8 B	5.4 B	12.9	17.5		149.1		17.8	55.2		309.0	6.2 B		19.1	18.5
Cobalt	ug/l	-	6.6 B	38.4 B		4.7 B	1.5 B	5.0 B	9.4 B	12.0 B	1.6 B	27.1 B	4.8 B	2.2 B	6.8 B	49.4 B	50.7	5.5 B		15.7 B	5.4 B
Copper	ug/l	200	14.9 B	23.5 B		4.5 B	2.1 B	3.3 B	4.3 B	37.5		69.1	8.2 B	16.9 B	17.1 B	23.5 B	70.7	3.1 B		9.4 B	15.9 B
Iron	ug/l	300	40465	9880 G	701	56000	20600	40328	19645	11286	2288	55674	9737	15893	17266	4572	40800 G	14960	826	3828	60699
Lead	ug/l	25	11.7	13.9 G		27.4	4.2 J	7.3 J	2.4 J	19.1		23.6	2.0 J	11.5	11.3		22.9 G	4.2 J		6.7 J	52.2
Magnesium	ug/l	35000	59738	66800	45396	56453	52339	55991	51762	117800	53503	95137	62987	28738	34317	129160	99700	57111	42499	52571	61180
Manganese	ug/l	300	481.0	504.0	120.6	397.2	257.8	275.9	689.4	1563.6	53.8	2107.6	1340.7	382.6	647.9	7633.1	3710.0	713.0	33.4	336.3	341.6
Nickel	ug/l	100	24.6 B	34.6 B		29.7 B	6.8 B	37.2 B	15.0 B	21.7 B		118.1	18.7 B	15.0 B	44.1	136.8	269.0	25.2 B		29.0 B	55.6
Potassium	ug/l	-		20100	8077 ENJ			141530								27696	29400	100960	2881 B		
Selenium	ug/l	10		7.8												7.1 J					
Silver	ug/l	50												4.1 B							
Sodium	ug/l	20000	80169 EJ	21900	80602 EJ	242440 EJ	97106 EJ	356940	83005 EJ	25869 EJ	1256700 EJ	29865 EJ	98973 EJ	26980 EJ	48167 EJ	22919	22600	208810	66930	139790 EJ	167750 EJ
Thallium	ug/l	0.5						5.8 J								5.8 J		5.8 J	5.8 J		
Vanadium	ug/l	-	8.0 B			3.0 B	2.0 B	5.7 B	2.8 B	11.0 B		51.3		3.6 B	12.8 B		36.2 B	2.6 B		4.1 B	3.4 B
Zinc	ug/l	2000		87.5				22.8			6.1 *					59.7	255.0	22.2	41.8		
Cyanide	ug/l	200											14.8								16.4

TABLE 4-1
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER

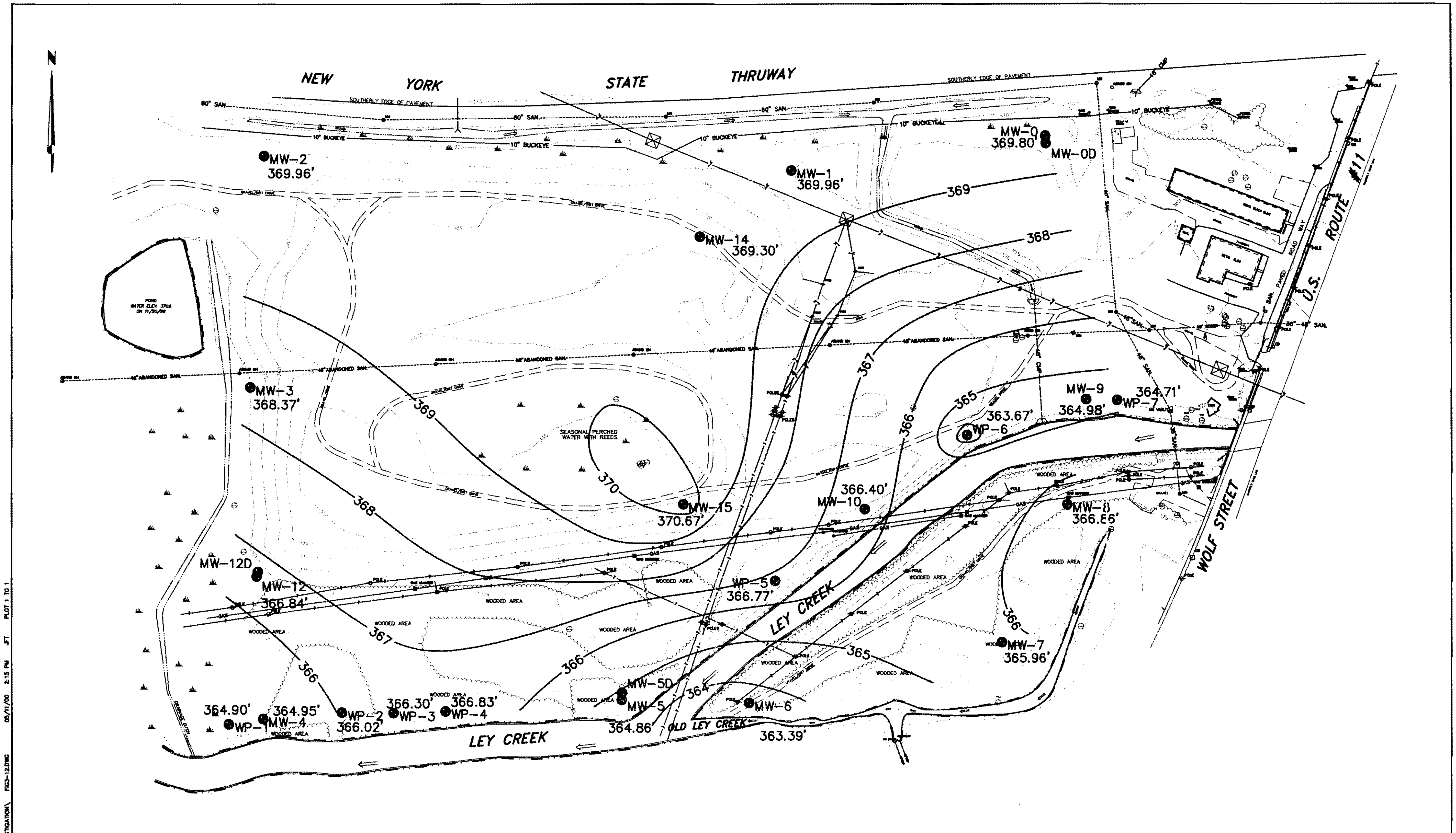
Sample ID / Lab Sample Number / Sampling Date	Units	TOGS 1.1.1 Standard or Guidance Value[1]	MW-0[2] A8340501 08/18/98	MW-0[2] 23199073 09/23/99	MW-0D[2] A8338501 08/17/98	MW-1 A8349801 08/24/98	MW-2 A8349804 08/24/98	MW-3 A8352701 08/25/98	MW-4 A8349806 08/24/98	MW-5 A8349805 08/24/98
Soluble Metals Analyses										
Aluminum	ug/l	2000		NA					62.4 B	147.0 B
Arsenic	ug/l	25	19.7	NA	4.7 B	6.8 B		8.2 B	7.7 B	6.5 B
Barium	ug/l	1000	455.7 EJ	NA	31.7 EJ	416.9 EJ	322.2 EJ	809.7	575.5 EJ	46.0 EJ
Cadmium	ug/l	5	3.15 B	NA	1.17 B	**31.41**	**10.79**	**26.78**	**11.56**	
Calcium	ug/l	-	209150	NA	230050	157870	139540	159170	222270	116710
Chromium	ug/l	50		NA		3.1 B		4.6 B	8.7 B	
Cobalt	ug/l	-	3.65 B	NA	1.89 B	4.13 B	1.36 B	5.21 B	9.06 B	2.33 B
Copper	ug/l	200	2.09 B	NA						
Iron	ug/l	300	**4792**	NA	**634**	**53568**	**18518**	**45061**	**19711**	**306**
Lead	ug/l	25		NA						
Magnesium	ug/l	35000	**62067**	NA	**45501**	**57902**	**54101**	**60777**	**52651**	**36747**
Manganese	ug/l	300	**538.45**	NA	116.73	**370.09**	239.5	279.39	**831.72**	19.79
Nickel	ug/l	100	11.8 B	NA		27.6 B	7.4 B	36.0 B	11.8 B	7.9 B
Potassium	ug/l	-	25563 ENJ	NA	8522 EJ	80403 ENJ	32888 ENJ	154670	31696 ENJ	3430 ENJ
Selenium	ug/l	10	**12.04**	NA				5.74 J		
Silver	ug/l	50		NA						
Sodium	ug/l	20000	**109990** EJ	NA	**80295** EJ	**236730** EJ	**102650** EJ	**372040**	**82360** EJ	**22604** EJ
Vanadium	ug/l	-		NA		2.12 B		3.36 B	2.9 B	
Zinc	ug/l	2000	31.01 EJ	NA	15.71 EJ	10.21 EJ	14.02 EJ	9.55 B	3.26 EJ	18.73 EJ
Wet Chemistry										
Ammonia	mg/l	2	**40**	NA	0	**72**	**20**	**100**	**32**	0
Biochemical Oxygen Demand	mg/l	-	2.2	NA		2.9		5.2		
Chloride	mg/l	250	81	NA	205	**284**	149	**414**	87	75
Filterable Residue	mg/l	-	480	NA	1130	1322	820	1677	1034	600
Nitrate	mg/l	10		NA		0.05 JP	0.05 J			0.05 J
Nitrite	mg/l	1	NA	NA	NA	0.05 J	0.05 J	NA		0.05 J
Sulfate	mg/l	250	23	NA	**412**	15	22	25	6	114
Total Alkalinity	mg/l	-	1122	NA	267	1038	645	1184	963	626
Total Hardness	mg/l	-	1164.8	NA	794.6	970.2	576.2	529.2	646.8	1822.8
Total Kjeldahl Nitrogen	mg/l	-	38.15	NA	0.23	71.47	19.47	98.79	36.58	0.27
Total Organic Carbon	mg/l	-	26	NA		253	111	254	186	41
Total Recoverable Phenolics	mg/l	0.001		NA						
Turbidity	N.T.U.	5	**200**	NA	**16**	**175**	**165**	**78**	**210**	**680**
Total VOCs	ug/l		41	0	0	25	0	94	0	0
Total SVOCs	ug/l		3	0	0	5	0	2	0	0
Total Pesticides			0.031	0	0	0	0.015	0.027	0	0
Total PCBs	ug/l		0	0	0	0.180	0	0	0	0.270

Sample ID / Lab Sample Number / Sampling Date	MW-5D A8346002 08/20/98	MW-6 A8340301 08/18/98	MW-7 A8343201 08/19/98	MW-8 A8340302 08/18/98	MW-9 A8340502 08/18/98	MW-10 A8349901 08/24/98	MW-10 23199074 09/23/99	MW-12 A8352702 08/25/98	MW-12D A8352703 08/25/98	MW-14 A8349802 08/24/98	MW-15 A8348201 08/21/98
Soluble Metals Analyses											
Aluminum					279.4	1067.7	NA			349.9	
Arsenic	14.9	**67.6**	6.3 B	8.0 B	**27.6**	17.0	NA	8.3 B	4.7 B		4.7 B
Barium	32.4 EJ	79.7 EJ	695.9 EJ	307.8 EJ	74.0 EJ	**1702.5**	NA	665.8	70.9 B	310.5 EJ	702.9 EJ
Cadmium	1.15 B		**8.92**	**7.03**	3.56 B	1.24 B	NA	**9.07**		2.24 B	**29.72**
Calcium	277750	191760	135430	134280	207770	656090	NA	208930	131290	133030	177540
Chromium				2.0 B	3.6 B		NA	2.6 B		8.0 B	3.4 B
Cobalt		3.83 B	4.65 B	1.39 B	1.6 B	50.75	NA	3.98 B		10.81 B	5.23 B
Copper		3.63 B	2.04 B	1.89 B	7.88 B	21.95 B	NA			5.97 B	
Iron	**2203**	288	**14123**	**11373**	**5333**	**1730**	NA	**14987**	**841**	**3476**	**50752**
Lead						2.2 B	NA				
Magnesium	**55265**	**53609**	**60401**	28938	29444	144	NA	**61328**	**46735**	**52684**	**64544**
Manganese	47.15	**664.09**	**1123.4**	**404.59**	**558.63**	**7595.8**	NA	**670.32**	30.56	**343.98**	294.58
Nickel		11.2 B	18.8 B	12.1 B	8.9 B	**141.9**	NA	22.7 B		21.5 B	44.7
Potassium	29331 ENJ	8881 ENJ	25153 ENJ	11825 ENJ	26231 ENJ	29226	NA	109990	2931 B	51495 ENJ	100940 ENJ
Selenium		6.12	5.9	7.46		**18.17** J	NA	7.25 J			6
Silver							NA				
Sodium	**1169800** EJ	**31860** EJ	**99411** EJ	**26573** EJ	**49412** EJ	**231181**	NA	**214830**	**69019**	**117540** EJ	**162300** EJ
Vanadium					4.84 B	1.75 B	NA			1.8 B	1.67 B
Zinc	4.6 EJ	33.1 EJ	79.26 EJ	29.68 EJ	81.91 EJ	52.16	NA	5.07 B	26.45	33.91 EJ	25.62 EJ
Wet Chemistry											
Ammonia	1	1	**69**	**67**	**19**	**15**	NA	**94**	0	**16**	**77**
Biochemical Oxygen Demand		3.9	3.6 J	11.1	2.3	93.9	NA	11.9		6.0	10.5
Chloride	**2040**	42	217	55	97	73	NA	**278**	146	124	196
Filterable Residue	4696	995	987	539	776	990 J	NA	1440	657	830	1361
Nitrate			0.78				NA			0.05 J	
Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 J	NA
Sulfate	**346**	**279**	18	11	76	25	NA	16	74	37	
Total Alkalinity	281	639	813	677	617	1043	NA	1231	376	720	1272
Total Hardness	985.5	1019.2	603.2	478.4	686.4	1822.8	NA	754.6	474.3	623.3	709.5
Total Kjeldahl Nitrogen	0.99	1.04	72.38	31.12	18.94	88.16	NA	90.25	0.15	15.59	87.51
Total Organic Carbon		9	148	26		239	NA	210	20	90	49
Total Recoverable Phenolics						**0.08**	NA				
Turbidity	**14**	**6000**	**56**	**96**	**160**	**12800**	NA	**80**	**9**	**136**	**95**
Total VOCs	0	88	218	28	128	152,192	122,383	13	0	3	140
Total SVOCs	0	2	6	16	22	451	313	0	0	9	18
Total Pesticides	0	0	0.020	0.055	0	0.053	0	0.013	0	0	0
Total PCBs	0	1.000	0	1.600	0.430	0	0	0	0	0	0.980

Footnote:
1. Shaded, Boldface values exceed TOGS 1.1.1 Standard or Guidance values for Class GA Groundwater.
2. MW-0 and MW-0D are considered background samples.

Organic Data Qualifiers:
B - Indicates compound was found in the associated blandk as well as in the sample.
D - Indicates compound identified in analysis at secondary dilution factor.
E - Indicates compounds whose concentrations exceeded the calibration range.
G - Indicates compound concentration considered estimated based on review of data.
J - Indicates an estimated value.
NA - Indicates not analyzed.
P - Indicates there was a greater than 25% difference between the two GC column results for a pesticide/Aroclor. The lower value is reported.

Inorganic Data Qualifiers:
B - Indicates compound concentration was more than or same as the instrument detection limit, but less than the contract required limit.
E - Indicates compound concentration is an estimated value or not reported due tc the presence of interference.
G - Indicates compound concentration considered estimated based on review of data.
J - Indicates an estimated value.
N - Indicates a spike sample recovery was not within the control limits.
NA - Indicates not analyzed.



NOTE:

GROUNDWATER ELEVATIONS BASED ON FIELD MEASUREMENTS TAKEN ON 08/28/98.

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FIGURE 3-12

GROUNDWATER FLOW MAP

TOWN OF SALINA LANDFILL RI/FS

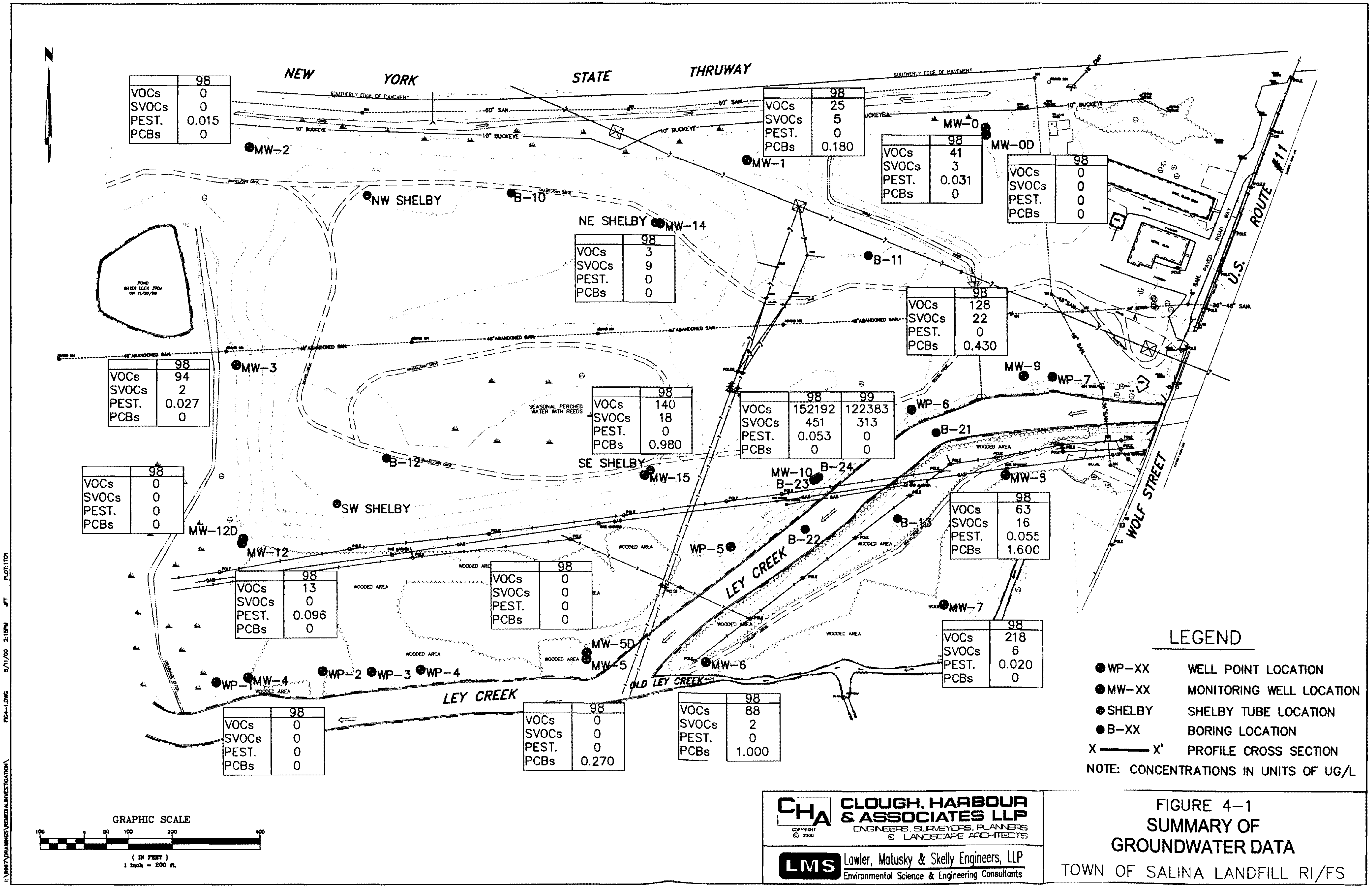


FIGURE 4-1
SUMMARY OF GROUNDWATER DATA
TOWN OF SALINA LANDFILL RI/FS

TABLE 4-2
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS
FOR DIOXIN DATA FOR GROUNDWATER

Sample ID Lab Sample Number Sampling Date	UNITS	TOGS 1.1.1 Standard or Guidance Value[1]	MW-10 23099070 8/31/99	MW-10(DUP) 23099071 8/31/99	MW-0 [5] 23199073 8/31/99	TOXICITY EQUIVALENCY FACTOR (TEF)[3]
ANALYTES						
1,2,3,4,7,8-HxCDD	pg/l	See Footnote 2		2.8 J*	2.8 J	0.100
1,2,3,6,7,8-HxCDD	pg/l	See Footnote 2		4.0 JB	3.8 JB*	0.100
1,2,3,7,8,9-HxCDD	pg/l	See Footnote 2		4.4 JB	3.4 JB*	0.100
1,2,3,4,6,7,8-HpCDD	pg/l	See Footnote 2	6.7 J	10.6 JB	15.0 JB	0.010
1,2,3,4,6,7,8,9-OCDD	pg/l	See Footnote 2	172.0	181.0	134.0	0.001
2,3,7,8-TCDF	pg/l	See Footnote 2		4.0 J	7.8 J	0.100
1,2,3,7,8-PeCDF	pg/l	See Footnote 2			2.5 J	0.050
2,3,4,7,8-PeCDF	pg/l	See Footnote 2			2.5 J	0.500
1,2,3,4,7,8-HxCDF	pg/l	See Footnote 2	2.4 J	3.0 JB	3.4 JB	0.100
1,2,3,6,7,8-HxCDF	pg/l	See Footnote 2		2.8 JB	2.2 JB	0.100
2,3,4,6,7,8-HxCDF	pg/l	See Footnote 2		2.9 J	1.7 J*	0.100
1,2,3,7,8,9-HxCDF	pg/l	See Footnote 2		3.9 JB	2.5 JB	0.100
1,2,3,4,6,7,8-HpCDF	pg/l	See Footnote 2		4.1 JB*	5.7 JB	0.010
1,2,3,4,7,8,9-HPCDF	pg/l	See Footnote 2			2.6 J*	0.010
1,2,3,4,6,7,8,9-OCDF	pg/l	See Footnote 2		8.1 J	13.0 J	0.001
Total TEQ:	pg/l	0.7	0.48	**3.12**	**4.50**	

Footnotes:
1. Shaded, boldface values exceed TOGS 1.1.1. Standard or Guidance Values for Class GA Groundwater.
2. Value is for the total of the chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans.
3. The congener equivalent for the standard is obtained by multiplying the concentration of that congener by its TEF.
4. EMPC values are included in the Total Toxicity Equivalence Quotient (TEQ).
5. MW-0 and MW-0D are considered background samples.

Organic Qualifiers:
B - Indicates compound was found in the associated blank as well as in the sample.
J - Indicates an estimated value; compound presend below quanititaion limit
* Estimated Maximum Possible Concentration (EMPC) value.

TABLE 4-3
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER FROM TEMPORARY WELLS

Sample ID Lab Sample Number Sampling Date	UNITS	TOGS 1.1.1 Standards or Guidance Values[1]	WP-1 A8348202 8/21/98	WP-2 A8346004 8/20/98	WP-3 A8346005 8/20/98	WP-4 A8346001 8/20/98	WP-5 A8342803 8/19/98	WP-6 A8342802 8/19/98	WP-7 A8342801 8/19/98
Wet Chemistry									
Ammonia	mg/l	2	**6.36**	**54.51**	**56.83**	**59.97**	0.77	**10.08**	**7.27**
Biochemical Oxygen Demand	mg/l	-		4	4	4	2 J	15 J	2 J
Chloride	mg/l	250	76	66	108	72	66	**557**	1130
Filterable Residue	mg/l	-	522	1076	1061	1100	581	1711	760
Nitrate	mg/l	10	0.062	0.105	0.069	0.087			
Sulfate	mg/l	250	57	6	9	9	115	34	96
Total Alkalinity	mg/l	-	1900	969	1007	1026	324	616	440
Total Cyanide	ug/l	200	14.0	NA	NA	NA	NA	NA	NA
Total Hardness	mg/l	-	9568	788	723	723	520	790	562
Total Kjeldahl Nitrogen	mg/l	-	7.958	59.657	66.094	61.936	0.848	13.343	8.865
Total Organic Carbon	mg/l	-	87	32	34	31	14	82	33
Turbidity	N.T.U.	5	**85**	**120**	**70**	**79**	**56**	**102**	**72**

Footnote:

1. Shaded, Boldface values exceed TOGS 1.1.1 Standard or Guidance Value for Class GA Groundwater.

Inorganic Qualifiers:

J - Indicates an estimated value.

NA - Indicates not analyzed.

values. Only wells MW-8, MW-9, MW-10, and MW-15 contained any semi-volatile organic compounds that exceeded standards. Notably, the polycyclic aromatic hydrocarbon (PAH) compounds were absent from the groundwater. The groundwater also contained a few pesticides and polychlorinated biphenyls (PCBs). Aroclor 1248 was detected in wells MW-1, MW-5, MW-6, MW-8, MW-9, and MW-15 in excess of water quality standards or guidance values.

The groundwater in the confined aquifer was almost entirely free of organic compounds. The exception was well MW-0D, which contained 2 ug/l (estimated) of butyl benzyl phthalate. Note that well MW-0D is a background well.

The metals that exceed standards or guidance values include arsenic in wells MW-6 and MW-9; aluminum in wells MW-0, MW-5, MW-6, MW-9, and MW-10; chromium in wells MW-6, MW-9, and MW10; iron and sodium in all wells; magnesium in all wells except MW-8 and MW-9; cadmium in all wells except MW-0D, MW-5D, MW-10, MW-12D, and MW-14; and manganese in all wells except MW-0D, MW-2, MW-3, MW-5D, and MW-12D. In general, the highest concentrations of iron, magnesium, and manganese are present in the wells with the highest turbidity. There was typically little difference between the total and dissolved concentrations of all metals. Again, the only samples that exhibited large differences between the total and dissolved metals concentrations were those samples with high turbidity. One difference was that there were no samples exceeding the standard or guidance value for the dissolved concentrations of aluminum and chromium, while the total concentrations did exceed the standard for several samples. It should also be noted that the sodium and chloride concentrations are particularly elevated in well MW-5D. These parameters, as well as elevated concentrations of TDS and specific conductance, may indicate that the groundwater is slightly brackish. Iron, magnesium and sodium concentrations exceed water quality standards or guidance values for all three deep wells.

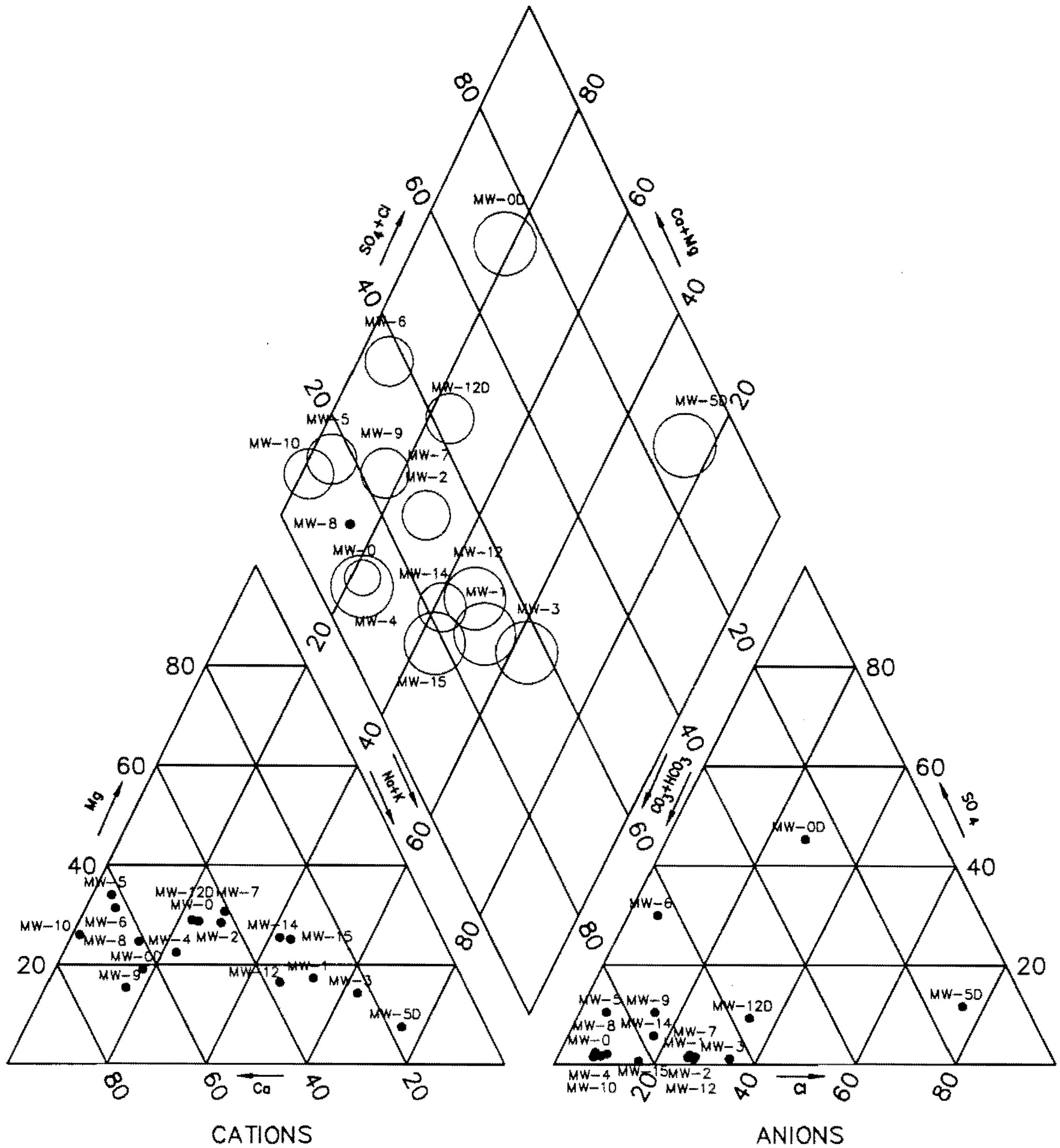
The sampling results for dioxin congeners indicates that, with the exception of 1,2,3,4,6,7, 8, 9 – OCDD, dioxins were generally absent or present in very low concentrations. Of the dioxins present, there was little difference between concentrations measured in downgradient well MW-10 and upgradient well MW-0, suggesting that there is no contribution of dioxins from the site. The 1,2,3,4,6,7, 8, 9 –OCDD was present at a concentration of 134 parts per quadrillion (ppq) in well MW-0 and a concentration of 172 ppq in well MW-10. On the whole, the total toxicity equivalence, calculated by multiplying the concentration by a toxicity equivalence factor (TEF) for each congener, is greater for the upgradient well than it is for the downgradient well.

Review of the wet chemistry data from the monitoring wells indicates that most of the shallow wells have been impacted by leachate. The ratio of alkalinity to sulfate can be used to show leachate impacts and the majority of the shallow wells show high alkalinity/sulfate ratios. Alternatively, the deep wells have a low alkalinity/sulfate ratio indicating they are have not been impacted by leachate. This evaluation is supported by the elevated presence of nitrogen compounds (ammonia and TKN) and total organic carbon in the shallow wells, but absence or low concentrations of these compounds in the deep wells. The total cation-anion concentrations for all wells have been plotted on a tri-linear diagram (Figure 4-2). The plot shows that wells MW-0D and MW-5D are distinct from the other wells in terms of major cation-anion chemistry. The water in the remainder of the wells would be characterized as a calcium, magnesium, bicarbonate type water. The cation-anion chemistry for well MW-12D falls on the edge of the field for all other wells in the shallow aquifer suggesting that the waters from the upper and lower aquifers may be mixing. However, the stratigraphical information and information on contaminant distribution within wells MW-12 and MW-12D do not support the notion that waters from the two aquifers are mixing.

Water samples were also collected from seven temporary wells that were installed in the water table aquifer along the north bank of Ley Creek. The wells were installed to help define groundwater flow direction and to aid in the understanding of the interconnection between groundwater and surface water. Three of the seven wells were installed immediately upgradient of active leachate seeps (Figures 2-5 and 2-7). The water samples were analyzed for wet chemistry parameters. Well point WP-1 was also inadvertently tested for cyanide. The results of the analyses are presented in Table 4-3. The results show high alkalinity/sulfate ratios and elevated concentrations of ammonia, TKN, and TOC. These results would appear to confirm that groundwater immediately adjacent to Ley Creek is impacted by landfill leachate.

4.2 LEACHATE

Three leachate samples were collected from the north bank of Ley Creek (see Figure 2-7). The samples were collected approximately 1 month after the majority of the sampling was completed. This delay was caused by high water levels in Ley Creek obscuring leachate seeps along the banks of the creek. The leachate samples were analyzed for all parameters on the Target Compound list, plus cyanide. The results for these samples are summarized in Table 4-4. There are no background samples for comparison of results. The organic compounds that exceeded Class GA groundwater standards or guidance values included benzene, chlorobenzene, and



NOTE:
MW-4D EXCLUDED
FROM DIAGRAM.

○ MONITORING WELLS

MW-1S	MW-4S
MW-1D	MW-5S
MW-2S	MW-5D
MW-2D	MW-6S
MW-3S	MW-7S
MW-3D	

TDS CONCENTRATION

○ <100 mg/l
○ 100-500
○ 500-1000
○ >1000

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FIGURE 4-2

DATE: NOVEMBER, 1998

CATION-ANION WATER CHEMISTRY TRI-LINEAR DIAGRAM

TOWN OF SALINA LANDFILL
SALINA, NEW YORK

TABLE 4-4
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR LEACHATE

Sample ID Lab Sample Number	Units	TOGS 1.1.1 Standard or Guidance Value[1]	L-1 A8415902 36068	L-2 A8415903 36068	L-6 A8415901 36068
TCL Volatile Organics					
Benzene	ug/l	1	**4** J		
Chlorobenzene	ug/l	5	**22**	**10**	
TCL Semivolatile Organics					
1,4-Dichlorobenzene	ug/l	3	2 J	2 J	
Pesticides & PCBs					
Aroclor-1248	ug/l	0.09	**1.0** J	**1.0** JP	**0.7** JP
Total Metals Analyses					
Aluminum	ug/l	2000	1051.5 ENJ	**12131.0** ENJ	**7260.5** ENJ
Barium	ug/l	1000	697.4 ENJ	**1501.6** EJ	460.4 EJ
Calcium	ug/l	-	219970 ENJ	263910 ENJ	251980 ENJ
Chromium	ug/l	50	42.1 EJ	**125.7** EJ	**106.4** EJ
Cobalt	ug/l	-	3.4 B	13.0 B	8.9 B
Copper	ug/l	200	30.0 EJ	140.4 EJ	86.4 EJ
Iron	ug/l	300	**53718** EJ	**156090** EJ	**31183** EJ
Lead	ug/l	25	**29.4** EJ	**198.9** EJ	**120.1** EJ
Magnesium	ug/l	35000	**52694** EJ	**69371** EJ	**65219** EJ
Manganese	ug/l	300	**412.5** EJ	**734.5** EJ	**1000.8** EJ
Nickel	ug/l	100	40.4	61.6	63.1
Potassium	ug/l	-	42867 EJ	48356 EJ	66501 EJ
Silver	ug/l	50		1.6 B	
Sodium	ug/l	20000	**67612** EJ	**81777** EJ	**190190** EJ
Vanadium	ug/l	-		19.3 B	
Zinc	ug/l	2000	91.1 EJ	403.6 EJ	321.1 EJ
Total VOCs	ug/l		25.8	10.3	0.0
Total SVOCs	ug/l		2.2	2.0	0.0
Totoal PCBs	ug/l		1.0	1.0	0.7

Footnote:

1. Shaded, boldface values except TOGS 1.1.1 Standard or Guidance Value for Class GA Groundwater.

Organic Qualifiers:

J - Indicates an estimated value.

P - Indicates there was a greater than 25% difference between the two GC column results for pesticide/Aroclor. The lower value is reportec

Inorganic Qualifiers:

B - Indicates compound concentration was more than or same as the instrument detection limit, but less than the contract required limit.

E - Indicates compound concentration is an estimated value or not reported due to the presence of interference.

J - Indicates an estimated value.

N - Indicates a spike sample recovery was not within the control limits.

Aroclor 1248. The metals that exceeded standards or guidance values included aluminum, barium, chromium, iron, lead, magnesium, manganese, and sodium.

4.3 SURFACE WATER

Surface Water Samples were collected from six locations. Location SW-20 was designated as the upgradient sample. The samples were analyzed for all parameters on the Target Compound List, plus cyanide, hardness, and BOD. The data are summarized in Table 4-5. The only organic compounds detected in any of the samples were benzo(k)fluoranthene detected in SW-23 and SW-24, and Aroclor 1248 detected in both samples SW-22 and SW-23. Sample SW-22 was collected near the confluence of the old Ley Creek and new Ley Creek channels and SW-23 was collected near the confluence of the drainageway along the western border of the landfill with Ley Creek. Sample SW-24 was collected near the confluence of the Beartrap Creek and Ley Creek channels. The site may be a potential source of Aroclor 1248, since it was not detected in the upgradient sample, but it was detected in samples in samples along the southern boundary of the landfill in Ley Creek.

The metals that exceeded standards or guidance values for Class B waters included aluminum and iron in all samples. However, only the concentrations in downstream samples SW-23 and SW-24 exceeded the concentrations detected in the background samples. Both metals did show a trend of increasing in concentration with increasing distance downstream. The increase in concentration of the metals between the 48-inch storm water discharge and the drainageway along the western border of the landfill indicates that groundwater flowing into the landfill and through the site that seeps into Ley Creek impacts the stream water quality. Cyanide was detected in three samples, SW-21, SW-22, and SW-24 in excess of the standards or guidance values for Class B waters.

4.4 SEDIMENT

At each surface water sample location, two sediment samples depths were targeted for collection; one from 0-6 inches below the sediment/water interface and a second from 6-12 inches below the interface (sample designated with a "D"). However, in most cases, the water content of the sediments was so high that it was difficult to collect these distinct intervals. The sediment samples were analyzed for the parameters on the Target Compound List, plus cyanide and total organic carbon. The results are summarized in Table 4-6 and Figure 4-3. As with the surface water samples, samples SED-20 and SED-20D were collected upgradient of the site. Sample

TABLE 4-5
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE WATER

Sample ID Lab Sample Number Sampling Date	Units	TOGS 1.1.1 Standard or Guidance Value[1]	SW-20[7] A8355202 08/26/1998	SW-21 A8355203 08/26/1998	SW-22 A8355204 08/26/1998	SW-23 A8359201 08/27/1998	SW-24 A8359202 08/27/1998	SW-25 A8355201 08/26/1998
TCL Volatile Organics								
TCL Semivolatile Organics								
Benzo(k)fluoranthene	ug/l	0.002				**10.0** J	**10.0** J	
Pesticides & PCBs								
Aroclor-1248	ug/l	1.0E-06			**0.10** JP	**0.14** JP		
Total Metals Analyses								
Aluminum	ug/l	100	**217**	**169** B	**204**	**221**	**238**	**137** B
Barium	ug/l	1000	63.9 B	70.4 B	66.3 B	75.9 B	77.8 B	50.2 B
Calcium	ug/l	-	70050	77173	80277	94166	93411	40240
Chromium	ug/l	147.3 [2]					2.3 B	
Copper	ug/l	18.3 [3]	5.5 B	7.2 B	8.6 B	7.2 B	6.4 B	12.7 B
Iron	ug/l	300	**576.4**	**444.4**	**527.9**	**607.3**	**701.6**	**566.0**
Lead	ug/l	9.3 [4]	3.3 J	4.0 J	3.6 J	3.7 J	5.6 J	2.1 J
Magnesium	ug/l	35000	11143	12319	12588	15455	16045	8359
Manganese	ug/l	300	80.8	80.2	82.5	113.7	124.5	217.3
Nickel	ug/l	105.7 [5]	1.9 B	2.4 B	2.6 B	2.9 B	3.0 B	
Potassium	ug/l	-	3826 B	3703 B	3717 B	4076 B	4096 B	3665 B
Sodium	ug/l	-	57471	68457	67847	83318	85413	50466
Vanadium	ug/l	14	1.3 B		1.5 B	1.8 B	1.6 B	
Zinc	ug/l	168.5 [6]	19.0 B	23.6	53.1	33.3	20.0	19.0 B
Cyanide	ug/l	5.2		**18.6**	**13.6**		**13.6**	
Wet Chemistry								
Biochemical Oxygen Demand	mg/l	-			2.4			4.1
Total Hardness	mg/l	-	219.5	231.3	239.1	282.2	290.1	125.4

Footnotes:

1. Shaded, boldface values exceed TOGS 1.1.1 Water Quality Standards or Guidance Values for Class B Surface Waters. Average hardness of 231.3 mg/l used in calculations.
2. (0.86) exp(0.819 [ln(ppm hardness)] + 0.6848)
3. (0.96) exp(0.8545 [ln(ppm hardness)] - 1.702)
4. {1.46203 - [ln(ppm hardness) (0.145712)]} exp(1.273 [ln(ppm hardness)] - 4.297)
5. (0.997) exp(0.846 [ln(ppm hardness)] + 0.0584)
6. exp(0.85 [ln(ppm hardness)] + 0.50)
7. SW-20 considered background sample.

Organic Qualifiers:

J - Indicates an estimated value.
P - Indicates there was a greater than 25% difference between the two GC column results for a pesticide/Aroclor. The lower value is reported

Inorganic Qualifiers:

B - Indicates compound concentration was more than or same as the instrument detection limit, but less than the contract required limit.
J - Indicates an estimated value.

TABLE 4-6
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL DATA FOR SEDIMENT

Sample ID Lab Sample Number Sample Date	Units	Tech. Guidance for Screening Contaminated Sediments[1] (ug/g OC)	Site-Specific Sediment Criteria[2]	SED-20[3] A8356403 08/26/98	SED-20D[3] A8356404 08/26/98	SED-21 A8356405 08/26/98	SED-21D A8356406 08/26/98	SED-22 A8356407 08/26/98	SED-22D A8356408 08/26/98	SED-23 A8359701 08/27/98	SED-23D A8359702 08/27/98	SED-24 A8359703 08/27/98	SED-24D A8359704 08/27/98	SED-25 A8356401 08/26/98	SED-25D A8356402 08/26/98
TCL Volatile Organics															
Acetone	ug/kg	-	-	14	14 J	37	32	26	24		26	138	78	50	71
Methylene Chloride	ug/kg	-	-									3 J	4 J	7 J	
Xylene (total)	ug/kg	92	198					5 J							
TCL Semivolatile Organics															
2,4-Dinitrophenol	ug/kg	-							2000 J						
2,4-Dinitrotoluene	ug/kg	-							2000 J						
Acenaphthene	ug/kg	140	301		250 J	300 J		**2900**			**350** J				
Acenaphthylene	ug/kg	-	-	650 J	300 J	500 J	400 J	1050 J	600 J		500 J				
Anthracene	ug/kg	107	230	**800** J	**550** J	**1150** J	**850** J	**2550**	**1200** J	**400** J	**800** J	**2000** J	**310** J		
Benzo(a)anthracene	ug/kg	1.3	2.8	**3,300** J	**2400** J	**4750**	**2950** J	**9100**	**4100** J	**2050** J	**3950**	**4500** J	**1230** J		
Benzo(a)pyrene	ug/kg	1.3	2.8	**3,950**	**2600** J	**4850**	**3200** J	**7450**	**4500** J	**2400** J	**4350**	**4000** J	**1090** J		
Benzo(b)fluoranthene	ug/kg	1.3	2.8	**6,000**	**3200** J	**11200**	**4900**	**11700**	**7200**	**3400**	**6850**	**5500** J	**1560**		
Benzo(g,h,i)perylene	ug/kg	-	-	1,100 J	750 J		1250 J	2000 J	1500 J	800 J	1300 J	1500 J	270 J		
Benzo(k)fluoranthene	ug/kg	1.3	2.8	**1,550** J	**1200** J		**1700** J	**2200** J	**2700** J	**1500** J	**2500** J	**2500** J	**470** J		
Bis(2-Ethylhexyl)phthalate	ug/kg	199.5	429.3	**4,250**	**2550** J	**5800**	**3200** J	**700** J	**6200**	**950** J	**2800**	**8000** J	420 J	110 J	
Carbazole	ug/kg	-	-	350 J		400 J		900 J			400 J				
Chrysene	ug/kg	1.3	2.8	**4,900**	**3150** J	**6600**	**4250**	**10150**	**6300**	**2900** J	**4900**	**6500** J	**1250** J		
Dibenz(a,h)anthracene	ug/kg	-	-	400 J	2300 J		500 J	900 J	600 J		550 J				
Dibenzofuran	ug/kg	-	-					600 J							
Di-n-Butylphthalate	ug/kg	-	-						1800 J					70 J	
Fluoranthene	ug/kg	1020	2195	**8,100**	**6050** J	**11250** J	**6900**	**19150**	**10700**	**5000**	**8750**	**11500** J	**2940**		
Fluorene	ug/kg	8	17		**300** J	**1000** J	**650** J	**4100**	**800** J		**600** J	**1000** J			
Indeno(1,2,3-cd)pyrene	ug/kg	1.3	2.8	**1,600** J	**1200** J		**1400** J	**3200**	**2300** J	**1300** J	**1900** J	**2000** J	**400** J		
Phenanthrene	ug/kg	120	258	**2,950** J	**1200** J	**5700**	**3950**	**9500**	**5300** J	**2200** J	**4500**	**8000** J	**1010** J		
Pyrene	ug/kg	961	2068	**7,700**	**5350** J	**23700** EJ	**7400**	**19400**	**8200**	**4300**	**9950**	**11500** J	1920		
Pesticides & PCBs															
Aroclor-1248	ug/kg	0.0008	0.0017	**49000** PDJ	**48000** PJ	**51000** PDJ	**73000** PDJ	**2400** PDJ	**81000** PJ	**3600** PJ	**2100** PJ	**51000** XPDJ	**2800** PXJ		
Aroclor-1260	ug/kg	0.0008	0.0017	**2300** J	**1700** J	**2400** J	**4800** J	**1200** J	**4100** J	**540** PJ	**1400** J	**3,200** PJ	**280** JPX		
Total Metals Analyses															
Aluminum	mg/kg		-	11074	6100	8179	7572	8158	7874	5854	8682	21176	28288	5086	2087
Arsenic	mg/kg		6.0	**7.0**	**15.1**	**9.8**	**6.6**	**7.4**	**7.2**	**7.7**	**8.5**	**20.8**	**25.7**	**6.7**	5.3 B
Barium	mg/kg		-	73.8 B	40.0 B	107.3	102.8	108.8	79.9	110.2	132.8	270.2	387.5	59.7	58.4 B
Beryllium	mg/kg		-	0.6 B	0.3 B	0.5 B		0.4 B	0.4 B		0.5 B	1.2 B	1.6 B		
Cadmium	mg/kg		0.6	**13.2**	**12.8**	**16.7**	**15.1**	**17.7**	**10.5**	**13.1**	**20.4**	**58.2**	**83.7**	**6.7**	**5.3**
Calcium	mg/kg		-	39731 *J	31396 *J	35407 *J	53982 *J	49219 *J	67533 *J	60718 *J	40838 *J	101368 *J	144802 *J	45895 *J	39740 *J
Chromium	mg/kg		26.0	**84** N*J	**169** N*J	**608** N*J	**872** N*J	**619** N*J	**232** N*J	**181** N*J	**931** N*J	**1216** N*J	**1767** N*J	10 N*J	5 BN*J
Cobalt	mg/kg		-	10.4 B	6.7 B	7.3 B	7.2 B	6.2 B	6.4 B	7.5 B	7.3 B	18.0 B	31.1 B	5.0 N*J	1.7 B
Copper	mg/kg		16.0	**80** N*J	**145** N*J	**354** N*J	**197** N*J	**174** N*J	**123** N*J	**132** N*J	**288** N*J	**343** N*J	**498** N*J	13	**28** N*J
Iron	mg/kg		2000000	20688	18911	17472	18236	14973	13827	16498	19954	41915	57252	10841 N*R	7400
Lead	mg/kg		31.0											8.2 *J	
Magnesium	mg/kg		-	11019.01 *J	5347.96 *J	8750.2714 *J	11102 *J	11286.84 *J	23996.65 *J	11406 *J	10652 *J	26159.425 *J	37003.86 *J	9174.5009 NJ	3233 B*J
Manganese	mg/kg		460.0	**728** NJ	189 NJ	301 NJ	371 NJ	267 NJ	296 NJ	346 NJ	333 NJ	**889** NJ	**1133** NJ	283 N*J	181 NJ
Mercury	mg/kg		0.15			**0.26**		**0.29**	**0.26**	**0.20**	**0.31**	**0.41**	**0.74**	**0.15** EJ	
Nickel	mg/kg		16.0	**47.0** N*J	**80.5** N*J	**197.1** N*J	**125.1** N*J	**119.2** N*J	**81.9** N*J	**61.1** N*J	**235.0** N*J	**250.0** N*J	**363.0** N*J		11.4 BN*J
Potassium	mg/kg		-	1561 BEJ	1022 BEJ	1169 BEJ	1256 BEJ	1708 EJ	1779 EJ	906 EJ	1505 EJ	3652 EJ	4896 EJ	997 BEJ	218 BEJ
Selenium	mg/kg		-							2.0 BNJ					
Silver	mg/kg		1.0		**1.2** BNJ	**3.4** NJ	**2.3** BNJ	**2.8** BNJ	**1.7** BNJ	**1.7** B	**3.8** NJ	**5.7** BNJ	**8.7** BNJ		
Sodium	mg/kg		-	2156	1630	1166 B	1581 B	1253 B	1411 B		1208 B	3239	4666	1360 B	3852 B
Thallium	mg/kg		-							2.3 ENJ					
Vanadium	mg/kg		-	22.3	15.5	22.1	21.1	26.5	20.2	19.6 NJ	26.1	55.9	76.7	11.9 B	11.8 B
Zinc	mg/kg		120.0	106 ENJ	**142** ENJ	**345** ENJ	**365** ENJ	**394** ENJ	**149** ENJ	**262**	**409** ENJ	**850** ENJ	**1185** ENJ	44 ENJ	52 ENJ
Cyanide	mg/kg			4 NJ	4 NJ	3 NJ	6 NJ	9 NJ	3 NJ		2 NJ	12 NJ	3 NJ		
Other Parameters															
Total Organic Carbon	mg/kg		-	1960	1340	1450	1950	1100	1730	1470	1180	3850	2430	5070	2290
% Solids	%		-	48	72	63	49	68	58	49	60	31	22	66	18
Total VOCs	ug/kg			14	14	37	32	30	24	0	26	141	82	56	71
Total SVOCs	ug/kg			47600	33350	77200	43900	107550	68000	27200	54950	68500	12870	180	0
Total PCBs	ug/kg			51300	49700	53400	77800	3600	85100	4140	3500	54200	3080	0	0

Footnotes:

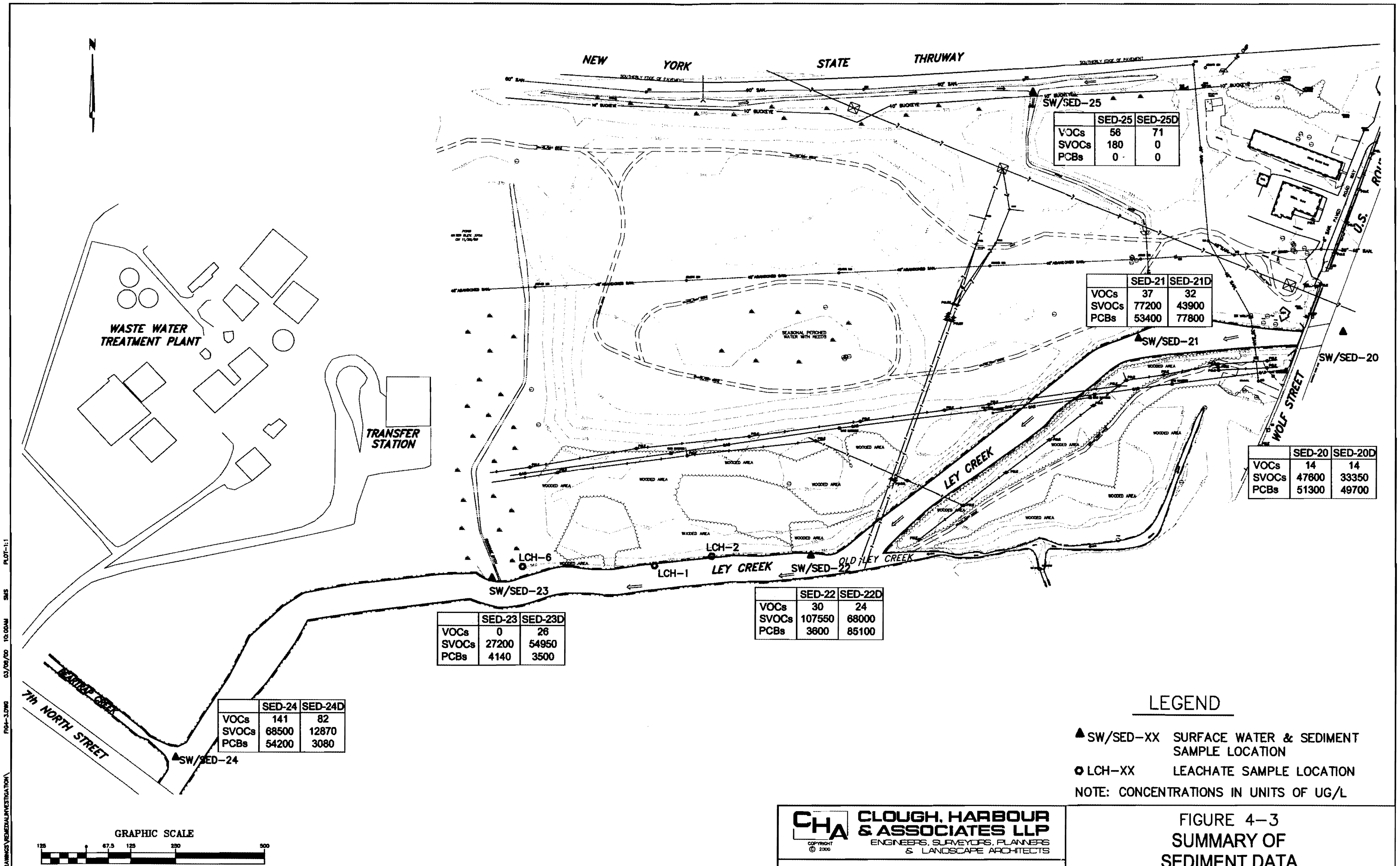
1. Shaded, Boldface values exceed Technical Guidance for Screening Contaminated Sediments or Site-Specific values noted above. Indicates a value for Protection of Human Health Bioaccumulation or most stringent standard for organic compounds. Value for Lowest Effect Level for Metals.
2. Site-Specific value corrected for an average organic Carbon content of 2151.7 mg/kg (2.1517 g OC/kg Sed.)
3. SED-20 and SED20-D are considered background samples.

Organic Qualifiers:

D - Indicates compound identified in analysis at secondary dilution factor.
E - Indicates compounds whose concentrations exceeded the calibration range.
J - Indicates an estimated value.
P - Indicates there was a greater than 25% difference between the two GC column results for a pesticide/Aroclor. The lower value is reported.
X - Indicates the use of alternate chromatographic peaks.

Inorganic Qualifiers:

B - Indicates compound concentration was more than or same as the instrument detection limit, but less than the contract required limit.
E - Indicates compound concentration is an estimated value or not reported due to the presence o interference.
J - Indicates an estimated value.
N - Indicates a spike sample recovery was not within the control limits.
* Indicates duplicate analyses were not within the control limits.



	SED-25	SED-25D
VOCs	56	71
SVOCs	180	0
PCBs	0	0

	SED-21	SED-21D
VOCs	37	32
SVOCs	77200	43900
PCBs	53400	77800

	SED-20	SED-20D
VOCs	14	14
SVOCs	47600	33350
PCBs	51300	49700

	SED-22	SED-22D
VOCs	30	24
SVOCs	107550	68000
PCBs	3600	85100

	SED-23	SED-23D
VOCs	0	26
SVOCs	27200	54950
PCBs	4140	3500

	SED-24	SED-24D
VOCs	141	82
SVOCs	68500	12870
PCBs	54200	3080

LEGEND

▲ SW/SED-XX SURFACE WATER & SEDIMENT SAMPLE LOCATION

O LCH-XX LEACHATE SAMPLE LOCATION

NOTE: CONCENTRATIONS IN UNITS OF UG/L

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FIGURE 4-3
SUMMARY OF SEDIMENT DATA
TOWN OF SALINA LANDFILL RI/FS

results have been compared to site-specific guidance values, derived in accordance with *Technical Guidance for Screening Contaminated Sediments* (1998) based on the average organic carbon content of the sediments.

Virtually every sediment sample contained the VOC acetone and three samples contained methylene chloride. All samples, except SED-25 and SED-25D, which were collected from the drainage ditch paralleling the New York State Thruway, contained numerous SVOCs in excess of guidance values. Specifically, the predominant SVOCs present in the sediments were PAHs. Despite the difficulty with sample collection, the uppermost sample almost always was 1.5 to 2 times higher in concentration compared to the deeper sample. The exception was sample SED-23 and SED-23D where the deeper sample contains the higher concentration of PAHs. Samples SED-21, SED-23, and SED-24 (and the deeper pairs) typically exhibited PAH concentrations only slightly above background concentrations. Sample SED-22 (and its deeper pair) exhibited PAH concentrations up to 3 times above background.

There were no pesticides detected in the sediments, but like the SVOCs, PCBs were detected in every sample in high concentrations with the exception of SED-25 and its deeper pair. There was no consistent pattern of PCB distribution with depth in the sediments: in some sample pairs, the concentrations were equal: in other pairs, the uppermost sample contained the higher concentration; and still in other pairs, the deeper sample contained the higher concentration. The Aroclors 1248 and 1260 were the PCBs detected. With the exception of the samples SED-21D and SED-22D, where the Aroclor 1248 concentrations were 1.52 and 1.69 times background, respectively, all of the other samples contained PCB concentrations less than or approximately equal to the background concentrations. Samples SED-21 (51 ppm), SED-21D (73 ppm), SED-22D (81 ppm), and SED-24 (51 ppm) are considered hazardous waste because the PCB concentrations are in excess of 50 ppm.

A number of metals were present in the sediments in excess of guidance values including arsenic, cadmium, chromium, lead, nickel, silver and zinc, virtually in all samples except SED-25 and SED-25D. Manganese was also detected in excess of guidance values in samples SED-20 and SED-20D, and SED-24 and SED-24D. Arsenic, cadmium, lead, and manganese were elevated above the background concentration in only samples SED-24 and SED-24D. Chromium, nickel, silver and zinc were elevated above background in all samples they were detected in excess of guidance values. The concentrations for chromium and zinc in the downgradient samples were significantly higher than background concentrations, indicating that the contamination in the landfill could be contributing to the contamination of the sediments in Ley Creek.

4.5 SURFACE SOIL

A total of twenty-nine surface soil samples were collected on and around the site. The number of samples was limited because a soil cover was placed over the waste in the 1980s. Samples -SS-40 and SS-41, collected on OCRRA property northwest of the site, were averaged to provide site background values. The samples were analyzed for Target Compound List, Target Analyte List plus cyanide and TOC. The data are summarized in Table 4-7. Results have been compared to soil cleanup guidance values in Technical and Administrative Guidance Memorandum 4046.

Methylene chloride was the only VOC detected, but was not above the guidance value. As with sediments, the predominant SVOCs were PAHs and these compounds were detected in every sample. The concentrations of SVOCs have been contoured and are depicted in Figure 4-4. The highest concentrations of PAHs were detected in samples SS-11, SS-12, SS-26, SS-27, SS-28, SS-29, SS-30, SS-32, SS-33, SS-36 and SS-37 collected over most of the landfill surface north of Ley Creek. However, only the concentrations of benzo(a) anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoroanthene, chrysene, and dibenzo(a,h)anthracene exceeded guidance values in several samples. A number of pesticides were detected in samples SS-11, SS-12, and SS-13, but none were in excess of guidance values. Aroclor 1248 was detected in two surface soil samples; SS-15 and SS-16 which are both located on the parcel between old Ley Creek and Ley Creek. The concentration of this PCB compound exceeded the guidance value for surface soil.

Evaluation of the metals data shows that almost all metals concentrations exceeded guidance values (site background) in every sample. In many cases, the metals concentrations in the samples collected on top of the landfill were present in concentrations only slightly above background (1 to 2 times). The notable exception was sample SS-16 which had a copper concentration 47 times the background level, a zinc concentration 32 times the background level, a chromium concentration 7 times the background level, and a nickel concentration 5 times the background level. Also, sample SS-11 had a mercury concentration 103 times the guidance value and sample SS-15 had a lead concentration 65 times the background.

TABLE 4-7
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL
(Page 1 of 2)

Sample ID Lab Sample Number Sampling Date	Units	TAGM 4046 Cleanup Standard[1]	SS-10 A8343301 08/19/98	SS-11 A8343302 08/19/98	SS-12 A8343303 08/19/98	SS-13 A8343304 08/19/98	SS-14 A8343305 08/19/98	SS-15 A8343306 08/19/98	SS-16 A8343307 08/19/98	SS-20 23799001 08/24/99	SS-21 23799002 08/24/99	SS-22 23799003 08/24/99	SS-23 23799004 08/24/99	SS-24 23799005 08/24/99	SS-25 23799006 08/24/99	SS-26 23799007 08/24/99	SS-27 23799008 08/24/99	SS-28 23799009 08/24/99
TCL Volatile Organics																		
Bromoform	ug/kg	-	11 J	11 J	11 J	11 J	10 J	12 J	12 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	ug/kg	100	1 J				1 J			NA	NA	NA	NA	NA	NA	NA	NA	NA
TCL Semivolatile Organics																		
1,4-Dichlorobenzene	ug/kg	8500																46 J
2-Methylnaphthalene	ug/kg	36400											170 J	130 J		250 J	540	360
4-Chloroaniline	ug/kg	220								210 J								110 J
4-Methylphenol	ug/kg	900																
Acenaphthene	ug/kg	50000		500 J						240 J			230 J	320 J		430	490	370
Acenaphthylene	ug/kg	41000		1800 J	900 J				50 J	290 J			260 J	310 J		670	990	890
Anthracene	ug/kg	50000		2500 J	1000 J	250 J			50 J	520	76 J		580 G	1000		1400	1200	1100
Benzo(a)anthracene	ug/kg	224	200 J	8300	4000	750 J	90 J	40 J	200 J	2000	390 G		1900 G	2400		4900 D	4000 D	2500
Benzo(a)pyrene	ug/kg	61	250 J		5200	800 J	130 J	40 J	270 J	2000	360 G		1600 G	1700	48 J	2700	2700	3600 D
Benzo(b)fluoranthene	ug/kg	1100		13900	6700	1250 J	170 J	60 J	400 J	2700	450 G		1700 G	2100		6800 D	6600 D	4900 D
Benzo(g,h,i)perylene	ug/kg	50000	1900 J	2000 J	1300 J	200 J	40 J		70 J	2500	160 J		1500 G	1300		2800	2700	4100 D
Benzo(k)fluoranthene	ug/kg	1100	1900 J	3700 J	2200 J	450 J	70 J	390 J	150 J	720	190 J		730 G	740		1100	1100	1300
Bis(2-Ethylhexyl)phthalate	ug/kg	50000		800 J	600 J		60 J	40 J	1360									
Carbazole	ug/kg	-		700 J	400 J					210 J			190 J	220 J		350 J	400	390
Chrysene	ug/kg	400	200 J	8300	4800	900 J	120 J	50 J	290 J	2200	460 G		2100 G	2200	68 J	5100 D	4900 D	4000 D
Dibenz(a,h)anthracene	ug/kg	14		900 J	500 J					840			350 J	340 J		700	880	960
Dibenzofuran	ug/kg	6200		3700 J						100 J			150 J	240 J		280 J	270	220 J
Di-n-Butylphthalate	ug/kg	8100																
Fluoranthene	ug/kg	50000	650 J	18000	9900	2300	250 J	100 J	520	2900	690 G	41 J	2600 G	6500 D	98 J	8800 D	7800 D	5700 D
Fluorene	ug/kg	50000		1100 J	400 J					210 J			270 J	570		360	580	470
Hexachlorobenzene	ug/kg	410								130 J								
Indeno(1,2,3-cd)pyrene	ug/kg	3200		3700 J	2200 J	400 J	70 J		130 J	2600	200 J		1700 G	1500		2800	2800	3900 D
Naphthalene	ug/kg	13000								190 J			230 J	110 J		330 J	640	320 J
Phenanthrene	ug/kg	50000	450 J	9200	4900	1150 J	90 J	50 J	210 J	2300	350 J		2500 G	4800 D	57 J	7800 D	6400 D	4800 D
Pyrene	ug/kg	50000	400 J	13800	7100	1450 J	170 J	90 J	410 J	5600 D	1100 G	44 J	3900 D	4800 D	100 J	9000 D	8100 D	11000 ED
Pesticides & PCBs																		
4,4' - DDD	ug/kg	2900		27	19	7												
4,4'- DDE	ug/kg	2100		2 JP	2 JP	15												
4,4'-DDT	ug/kg	2100	1 JP	2 P	20 P	16												
Aldrin	ug/kg	41		1.8 JP	1.4 J													
alpha-Chlordane	ug/kg	540		6.9 JP	4.4 JP													
BHC (beta Isomer)	ug/kg	200		2.7 JP	2.4 JP	2.1 P												
BHC (delta Isomer)	ug/kg	300		0.9 J	0.3 JP													
BHC (gamma Isomer) (Lindane)	ug/kg	60		0.71 JP	0.66 JP													
Dieldrin	ug/kg	44		6.8 JP	5.6 JP	0.8 JP	0.5 JP											
Endrin Aldehyde	ug/kg	-		14 JP	12 JP	1 JP												
Endrin Ketone	ug/kg	-		35 P	21 P	4 JP												
gamma-Chlordane	ug/kg	540		7.9 P	6.9 P	0.7 J												
Methoxychlor	ug/kg	-		17 JP	5 JP	3 JP												
Aroclor-1248	ug/kg	1000						220	8400 J									
Total Metals Analyses																		
Aluminum	mg/kg	10475	6854	8185	8061	7385	8713	11776	8826	9380	8560	8490	6330	6280	12300	7940	5350	9280
Arsenic	mg/kg	1.1	5	7	6	4	4	4	6							2.6		
Barium	mg/kg	61.85	56	140	137	50	61	59	108	169	176	52	69	68	53	530	136	189
Beryllium	mg/kg	0.16	0.38 B	0.48 B	0.47 B	0.36 B	0.41 B	0.47 B	0.42 B									
Cadmium	mg/kg	1	7.7	17.3	15.0	8.7	9.5	11.7	10.0	11.2	5.9	1.1	2.5	2.3	1.4	8.4	8.1	11.7
Calcium	mg/kg	10845	65353	119000	47914	8726	49698	53145	32423	61600 G	48200 G	42100 G	77800 G	25900 G	12000 G	44900 G	44900 G	56300 G
Chromium	mg/kg	10	17 J	61 J	44 J	29 J	58 J	36 J	127 J	90	68	15	36	21	19	65	62	82
Cobalt	mg/kg	8.55	6 B	8 B		5	12	17	6 B	8 B	9 B	9 B	6 B	6 B	8 B	8 B	6 B	9 B
Copper	mg/kg	18.45	18	100	69	25	24	46	860	113	109	47	55	36	20	86	101	104
Iron	mg/kg	2000	12172	17433	18681	12906	15579	18777	15396	18800	17600	14800	16000	12600	19500	16500	14300	19800
Lead	mg/kg	18.75	15	187	178	35	53	1163	49	216	225	10	53	37	9	164	133	251
Magnesium	mg/kg	6580	13885	20049	12500	4089	13559	22883	9729	15500	15100	27000	18000	9460	11200	15200	11700	17500
Manganese	mg/kg	492	327 J	471 J	371 J	347 J	481 J	449 J	334 J	390	338	369	423	386	557	373	285	383
Mercury	mg/kg	0.1		2.6	0.4					1.4	0.4		1.2	0.3		0.9	0.9	1.9
Nickel	mg/kg	13	19	40	35	17	17	26	82	46	53	22	43	17	23	38	32	47
Potassium	mg/kg	903.5	1347 J	1472 J	881 J	1132 J	2039 J	2872 J	1499 J	1230	1140	1460	1240	847	1930	1300	728 B	1490
Selenium	mg/kg	2								17 N	19 N	23 N	21 N	11 N	9 N	19 N	14 N	17 N
Silver	mg/kg	1.1		4	3				1 B	8	6					4	4	8
Sodium	mg/kg	108.25	737 B	786 B	693 B	663 B	859 B	875 B	816 B									
Thallium	mg/kg	1.1								2.9 N			2.4 N				2.6 N	
Vanadium	mg/kg	21.15	21	20	20	16	17	17	21	21	19	13	16	13	20	17	12	22
Zinc	mg/kg	20	48	192	194	74	171	732	1733	256 E	228 E	45 E	93 E	65 E	44 E	177 E	180 E	277 E
Other Parameters																		
% Solids	%	-	91	91	92	91	96	87	81	90	94	94	93	96	91	92	94	92
Cyanide	mg/kg	-		0.7	1.7		0.9	0.8	0.7									
Total Organic Carbon	ug/g		1160	1070	896	604	1140	1150	2060	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOCs	ug/kg	10	12	11	11	11	11	12	12	0	0	0	0	0	0	0	0	0
Total SVOCs	ug/kg	500	5950	92900	52100	9900	1260	860	4110	28460	4426	85	22660	31280	371	56570	52890	51036
Total Pesticides	ug/kg	10	0.61	124.21	100.17	48.35	0.45	0	0	0	0	0	0	0	0	0	0	0
Total PCBs	ug/kg	-	0	0	0	0	0	220	8400	0	0	0	0	0	0	0	0	0

TABLE 4-7
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL
(Page 2 of 2)

Sample ID Lab Sample Number Sampling Date	Units	TAGM 4046 Cleanup Standard[1]	SS-29 23799010 08/24/99	SS-30 23799011 08/24/99	SS-31 23799012 08/24/99	SS-32 23799013 08/24/99	SS-33 23799014 08/24/99	SS-34 23799015 08/24/99	SS-35 23799016 08/24/99	SS-36 23799017 08/24/99	SS-37 23799018 08/24/99	SS-38 23799019 08/24/99	SS-39 23799020 08/24/99	SS-40[2] 23799021 08/24/99	SS-41[2] 23799022 08/24/99	WORM COMPOSITE 23299139 08/20/99
TCL Volatile Organics																
Bromoform	ug/kg	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	ug/kg	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TCL Semivolatile Organics																
1,4-Dichlorobenzene	ug/kg	8500					47 J									
2-Methylnaphthalene	ug/kg	36400	120 J	440	46 J	380	430			95 J						
4-Chloroaniline	ug/kg	220	79 J	75 J			86 J									
4-Methylphenol	ug/kg	900														**1100**
Acenaphthene	ug/kg	50000	220 J	590	74 J	1000	550		75 J	200 J	120 J	61 J				
Acenaphthylene	ug/kg	41000	220 J	870	170 J	450	740		43 J	220 J		220 J				
Anthracene	ug/kg	50000	470 G	1300	200 J	2500	1000	67 J	200 J	510	220 J	280 J	60 J			
Benzo(a)anthracene	ug/kg	224	**1600** G	**2800**	**600** G	**8800** D	**2400**	**340** J	**730**	**1700**	**610**	**1900** G	170 J	44 J	50 J	
Benzo(a)pyrene	ug/kg	61	**1700** G	**5000** D	**730** G	**8700** D	**2700**	**370** G	**630**	**1400**	**440**	**2600** G	**150** J			
Benzo(b)fluoranthene	ug/kg	1100	**2000** G	**7100** D	1000 G	**12000** D	**5100** D	500 G	820	**1900**	770	**4100** D	220 J			
Benzo(g,h,i)perylene	ug/kg	50000	2000 G	3900 D	770 G	5200 D	4100 D	260 J	390	1600	410	2400 D	95 J			
Benzo(k)fluoranthene	ug/kg	1100	680 G	**1200**	370 G	**1600**	1000	200 J	360	610	230 J	1000 G	84 J			
Bis(2-Ethylhexyl)phthalate	ug/kg	50000														
Carbazole	ug/kg	-	160 J	350 J	47 J	700	360		63 J	150 J	84 J	59 J				
Chrysene	ug/kg	400	**1600** G	**5300** D	**680** G	**9100** D	**2700**	**500** G	**710**	**1700**	**680**	**2000** G	160 J	49 J	58 J	
Dibenz(a,h)anthracene	ug/kg	14	**360** G	**810**	**170** J	**950**	**720**		**120** J	**340** J	**99** J	**530** G				
Dibenzofuran	ug/kg	6200	130 J	310 J	47 J	510	300 J			110 J	65 J					
Di-n-Butylphthalate	ug/kg	8100														170
Fluoranthene	ug/kg	50000	2000 G	8100 D	1100 G	17000 D	5700 D	680 G	1800	2100	1400	1600 G	240 J	66 J	75 J	
Fluorene	ug/kg	50000	240 J	640	110 J	1000	530	36 J	91 J	230 J	160 J	85 J				
Hexachlorobenzene	ug/kg	410	110 J													
Indeno(1,2,3-cd)pyrene	ug/kg	3200	1500 G	**3400** JD	570 G	**5000** D	2900	260 J	440	1300	450	2400 G	91 J			
Naphthalene	ug/kg	13000	150 J	490	51 J	670	460			130 J		50 J				
Phenanthrene	ug/kg	50000	2100 G	6600 D	790 G	14000 D	5500 D	440 G	850	2200	1300	940 G	220 J	45 J	51 J	
Pyrene	ug/kg	50000	5400 EG	9400 D	2600 G	16000 D	9000 ED	1300 G	2500	5100 D	2700	3700 D	450	84 J	87 J	
Pesticides & PCBs																
4,4' - DDD	ug/kg	2900														NA
4,4'- DDE	ug/kg	2100														NA
4,4'-DDT	ug/kg	2100														NA
Aldrin	ug/kg	41														NA
alpha-Chlordane	ug/kg	540														NA
BHC (beta isomer)	ug/kg	200														NA
BHC (delta isomer)	ug/kg	300														NA
BHC (gamma isomer) (Lindane)	ug/kg	60														NA
Dieldrin	ug/kg	44														NA
Endrin Aldehyde	ug/kg	-														NA
Endrin Ketone	ug/kg	-														NA
gamma-Chlordane	ug/kg	540														NA
Methoxychlor	ug/kg	-														NA
Aroclor-1248	ug/kg	1000														
Total Metals Analyses																
Aluminum	mg/kg	10475	5770	7580	5940	6410	7460	6800	5700	8170	5160	5820	**13000**	9850	**1100**	26.4
Arsenic	mg/kg	1.1														**2.2**
Barium	mg/kg	61.85	**93**	**164**	51	**147**	**171**	**80**	32	**159**	58	50	44	60	**64**	
Beryllium	mg/kg	0.16														
Cadmium	mg/kg	1	**2.5**	**8.7**	**2**	**6.7**	**9.1**	**2.2**	**1.2**	**4.3**	**1.5**	**1.4**	**1.4**	**1.3**	**1.4**	**6.7**
Calcium	mg/kg	10845	**53900** G	**44500** G	**30600** G	**60100** G	**69600** G	**39700** G	6860 G	**51900** G	**45800** G	**45600** G	**23000** G	**12800** G	8890 G	734
Chromium	mg/kg	10	**22**	**42**	**18**	**60**	**69**	**116**	**11**	**47**	**14**	**13**	**34**	**17**	**20**	
Cobalt	mg/kg	8.55	6 B	8 B	5 B	6 B	8 B	6 B	5 B	8 B	5 B	6 B	7 B	**9** B	8 B	
Copper	mg/kg	18.45	55	95	31	85	94	103	**18**	75	36	26	25	23	**14**	5
Iron	mg/kg	2000	**7150**	**4800**	**11600**	**14700**	**17800**	**13600**	**9960**	**16300**	**10900**	**11500**	**17700**	**16000**	**6400**	44
Lead	mg/kg	18.75	**105**	**181**	**44**	**210**	**213**	**53**	**20**	**148**	**70**	**65**	**42**	**20**	18	4
Magnesium	mg/kg	6580	**14500**	**13900**	**13900**	**13800**	**15600**	**8730**	3580	**20200**	**9860**	**7700**	**19900**	**7410**	5750	
Manganese	mg/kg	492	354	384	340	297	459	273	321	374	331	334	376	**509**	475	7.2
Mercury	mg/kg	0.1	**0.9**	**1.2**	**0.4**	**1.3**	**1.5**	**0.3**		**0.6**	**0.2**	**0.2**				**0.3** G
Nickel	mg/kg	13	**29**	**44**	**16**	**35**	**41**	**70**	11	**37**	**14**	**14**	**34**	**16**	**16**	
Potassium	mg/kg	903.5	**981** B	**966** B	842 B	737 B	**959** B	**1170**	749 B	**1200**	557 B	588 B	**2180**	825 B	**982** B	843
Selenium	mg/kg	2	**19** N	**18** N	**15** N	**16** N	**16** N	**12** N	**5** N	**20** N	**15** N	**10** N	**18** N	**9** N	**3** N	**4**
Silver	mg/kg	1.1	**3**	**5**		**6**	**6**			**4**						
Sodium	mg/kg	108.25														**118**
Thallium	mg/kg	1.1	**3.6** N	**2.7** N		**3.6** N		**3.2** N		**2.6** N	**3.4** N	**2.8** N				
Vanadium	mg/kg	21.15			13	16	18	16	12	17	13	13	18	20	**22**	
Zinc	mg/kg	20	**121** E	**223** E	**64** E	**210** E	**230** E	**120** E	**39** E	**152** E	**95** E	**73** E	**86** E	**52** E	**62** E	**51**
Other Parameters																
% Solids	%	-	95	92	96	93	92	94	96	95	93	95	91	92	92	NA
Cyanide	mg/kg	-						3.3								NA
Total Organic Carbon	ug/g		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOCs	ug/kg	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SVOCs	ug/kg	500	**22839**	**58675**	**10125**	**105560**	**46323**	**4953**	**9822**	**21595**	**9738**	**23925**	**1940**	288	321	**1270**
Total Pesticides	ug/kg	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total PCBs	ug/kg	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Footnote:

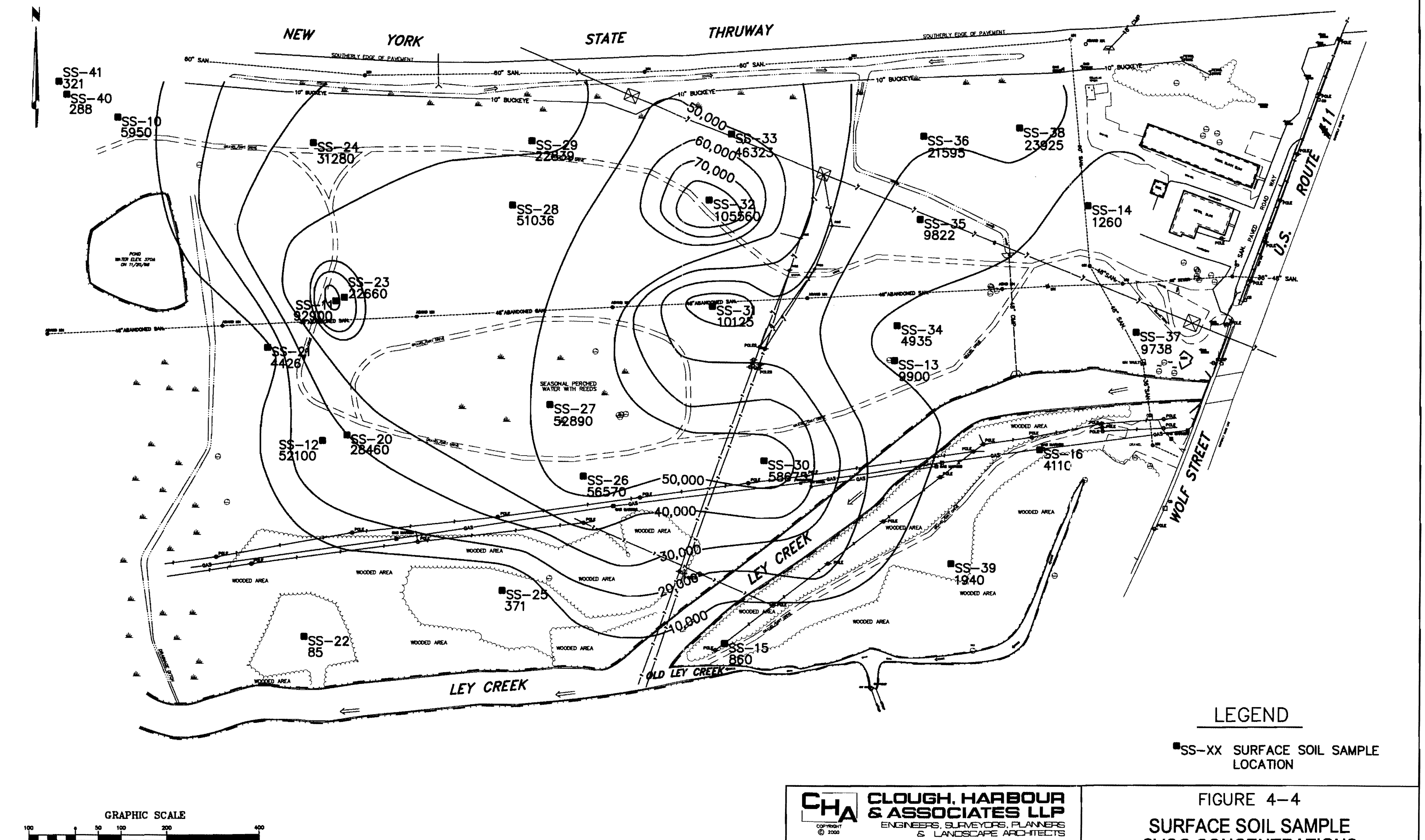
1. Shaded, boldface values exceed TAGM 4046 Cleanup Standards for Soil.
2. SS-40 and SS-41 were collected for site background data. TAGM 4046 Cleanup Standards for Metals in soils were based on the average of these two site background values or the value provided, whichever was more conservative.

Organic Qualifiers:

D - Indicates compound identified in analysis at secondary dilution factor.
E - Indicates compounds whose concentrations exceeded the calibration range.
G - Indicates compound concentration considered estimated based on review of data.
J - Indicates an estimated value.
NA - Indicates not analyzed.
P - Indicates there was a greater than 25% difference between the two GC column results for a pesticide/Aroclor. The lower value is reported.

Inorganic Qualifiers:

B - Indicates compound concentration was more than or same as the instrument detection limit, but less than the contract required limit.
E - Indicates compound concentration is an estimated value or not reported due to the presence of interference.
G - Indicates compound concentration considered estimated based on review of data.
J - Indicates an estimated value.
N - Indicates a spike sample recovery was not within the control limits.
NA - Indicates not analyzed.



LEGEND

■SS-XX SURFACE SOIL SAMPLE LOCATION

CLOUGH, HARBOUR & ASSOCIATES LLP
ENGINEERS, SURVEYORS, PLANNERS & LANDSCAPE ARCHITECTS

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Lawler, Matusky & Skelly Engineers, LLP
Environmental Science & Engineering Consultants

FIGURE 4-4

SURFACE SOIL SAMPLE SVOC CONCENTRATIONS

TOWN OF SALINA LANDFILL RI/FS

4.6 SUBSURFACE SOIL

Eight subsurface soil samples were collected from test pits during the waste area investigation. Samples were collected from test pits TP-8, TP-14, TP-31, TP-33, TP-34, TP-45, TP-46, and TP-47. The sample from TP-8 was collected from a black oily sludge with a strong petroleum odor. The samples from TP-45, TP-46 and TP-47 were collected near TP-8 in an attempt to determine the extent of the black oily sludge. The sample from TP-14 was collected from a very compact yellow sandy material, with no odor. The sample from TP-31 was collected from a dark stained soil, near where the original sanitary sewer line connected to the current sewer line (although the original sanitary sewer line was not located). The samples from TP-33 and TP-34 were collected from soils in contact with the original sanitary sewer line that crossed the site. The results are summarized in Table 4-8. The results have been compared to soil cleanup guidance values from *TAGM 4046*, although none of the samples were designated as background. Note however, that since guidance values for metals are based on site background levels, the average concentration from surface soil samples SS-40 and SS-41 were used to define the background level.

A number of VOCs were detected in the subsurface soil samples. In particular, sample TP-34 contained a relatively high concentration of total xylenes. Samples TP-45, TP-46 and TP-47 contained acetone and 2-butanone concentrations in excess of the guidance value. As with the surface soil samples, the subsurface soil samples all contained PAHs as the predominant subclass of SVOCs present in excess of guidance values. The subsurface soil samples did not contain pesticides but all samples contained PCBs. The samples from TP-8, TP-34, TP-45 and TP-46 contained Aroclor 1248 in excess of cleanup standards. The concentrations of Aroclor 1248 in TP-8, TP-45, and TP-46 (420 ppm, 74 ppm, and 180 ppm, respectively), were greater than 50 ppm, indicating the presence of hazardous waste in the area immediately north of the point of confluence of the Ley Creek and Old Ley Creek channels. The presence of hazardous waste in this area may be indicative of historical waste disposal in the landfill in this area.

Again, as with the surface soil samples, virtually all of the metals in all of the samples exceeded guidance values. However, the metals concentrations were generally within 1 to 2 times background concentrations. The exceptions were the samples from TP-8, TP-45 and TP-46 (collected along the edge of the creek, immediately north of the confluence of the Ley Creek and Old Ley Creek channels), where metals concentrations ranged from 2 to 250 times background concentrations. In particular, the concentrations of chromium and cyanide were significantly higher than both background concentrations and the concentrations found in other areas of the

TABLE 4-8
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR SUBSURFACE SOIL FROM TEST PITS
(Page 1 of 2)

Sample ID Sample Depth Lab Sample Number Sampling Date	Units	TAGM 4046 Cleanup Standard[1]	TP-8 7-8 ft. A8317201 08/05/98	TP-14 2-3 ft. A8321101 08/06/98	TP-31 8-10 ft. A8325301 08/10/98	TP-33 3-4 ft. A8325302 08/10/98	TP-34 10-11 ft. A8328601 08/11/98	TP-45 7-9 ft 23199070 08/18/99	TP-46 6-8 ft 23199071 08/18/99	TP-47 8-10 ft 23199072 08/18/99
TCL Volatile Organics										
1,1,1-Trichloroethane	ug/kg	800					59 J			
1,1-Dichloroethane	ug/kg	200					**377** EJ			
1,1-Dichloroethene	ug/kg	400					5 J			
1,2-Dichloroethene (total)	ug/kg	300					**766** EJ	NA	NA	NA
2-Butanone	ug/kg	300	50	5 J	45	9 J		**420** E	**360** G	130 G
Acetone	ug/kg	200	137	26	137	43	106 J	**1600** EG	**1400** EG	**590** EG
Benzene	ug/kg	60		2 J	5 J		27 J	8 J	10 J	9 J
Carbon Disulfide	ug/kg	2700	28					130 G	120 G	10 J
Chlorobenzene	ug/kg	1700			10 J		21 J	23 G	15 J	
Chloroethane	ug/kg	1900					283 EJ			
Chloroform	ug/kg	300						6 J	7 J	11 J
Ethylbenzene	ug/kg	5500		8 J			4562 DJ	20 G		**9700** G
Methylene Chloride	ug/kg	100	2 J		4 J	2 J	15 J			
Styrene	ug/kg	-								25 G
Tetrachloroethene	ug/kg	1400					6 J			
Toluene	ug/kg	1500		1 J			**147949** BDJ	8 J	6 J	16 J
Trichloroethene	ug/kg	700					3 J			
Vinyl Chloride	ug/kg	200					127 J			
Xylene (total)	ug/kg	1200	10 J				**45362** D	0.74 G	55	
TCL Semi-Volatile Organics										
1,2-Dichlorobenzene	ug/kg	7900					4400 J			
2,4-Dimethylphenol	ug/kg	-		350 J						92 J
2-Methylnaphthalene	ug/kg	36400		950 J						120 J
2-Methylphenol	ug/kg	100		**250** J						
4-Methylphenol	ug/kg	900					**1500** J			160 J
Acenaphthene	ug/kg	50000	3300 J		350 J				420 J	
Acenaphthylene	ug/kg	41000	2200 J						170 J	
Anthracene	ug/kg	50000	8400		800 J			1000	710	
Benzo(a)anthracene	ug/kg	224	**16000**		**1550** J	**1050** J	**1800** J	**1600**	**1400**	
Benzo(a)pyrene	ug/kg	61	**11700**	**400** J	**1250** J	**1000** J	**1100** J	**1700**	**1400**	
Benzo(b)fluoranthene	ug/kg	1100	**22200**	750 J	**1350** J	**1400** J	**2300** J	**2100**	**1900**	
Benzo(g,h,i)perylene	ug/kg	50000	4400 J		600 J	500 J	800 J	970	1400	
Benzo(k)fluoranthene	ug/kg	1100	**8600** UJN		400 J	400 J	1000 J	630	650	
Bis(2-Ethylhexyl)phthalate	ug/kg	50000	19000	550 J	600 J		5500	4700 E	3800	960
Chrysene	ug/kg	400	**15400**	**800** J	**1350** J	**1050** J	**1900** J	**1800**	**2400**	
Dibenz(a,h)anthracene	ug/kg	14	**1500** J							
Dibenzofuran	ug/kg	6200	3100 J						220 J	
Di-n-Butylphthalate	ug/kg	8100					1000 J			
Fluoranthene	ug/kg	50000	43400		3150	2000	3900 J	4500 E	2900	280 J
Fluorene	ug/kg	50000	8300 J	300 J	500 J		600 J	1500	710	
Indeno(1,2,3-cd)pyrene	ug/kg	3200	**5200** J		600 J	650 J	1100 J	1100	1200	
Isophorone	ug/kg	4400		1850 J						350 J
Naphthalene	ug/kg	13000		750 J			1300 J		140 J	120 J
Phenanthrene	ug/kg	50000	37200	1000 J	3350	850 J	3900 J	5500 E	2900	420 J
Phenol	ug/kg	30		**500** J						
Pyrene	ug/kg	50000	39300	750 J	3150	1750 J	3600 J	6600 E	6900 E	340 J
Pesticides & PCBs										
Aroclor-1248	ug/kg	1000	**420000** PDJ	87 P	950	130	**2300** P	**74000** G	**180000** G	

TABLE 4-8
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR SUBSURFACE SOIL FROM TEST PITS

(Page 2 of 2)

Sample ID Sample Depth Lab Sample Number Sampling Date	Units	TAGM 4046 Cleanup Standard[1]	TP-8 7-8 ft. A8317201 08/05/98	TP-14 2-3 ft. A8321101 08/06/98	TP-31 8-10 ft. A8325301 08/10/98	TP-33 3-4 ft. A8325302 08/10/98	TP-34 10-11 ft. A8328601 08/11/98	TP-45 7-9 ft 23199070 08/18/99	TP-46 6-8 ft 23199071 08/18/99	TP-47 8-10 ft 23199072 08/18/99
Metals										
Aluminum	mg/kg	10475	**20587**	6417	6279	10563	7218	9030	7480	4730
Antimony	mg/kg	1.625	**8.2** BNJ	**2.1** BNJ	**1.9** BNJ			**9.9** BN	**22.0** N	
Arsenic	mg/kg	1.1	**16.2**	**6.2** *J	**11.7**	**4.2** *J	**17.0** *J		**14.2** N	**20.8** N
Barium	mg/kg	61.85	**251** EJ	**76** EJ	61 EJ	60	**110**	**162**	**147**	**136**
Beryllium	mg/kg	0.16	**1.3** BNJ	**0.5** BNJ	**0.4** BNJ	**0.5** BNJ	**0.5** B			
Cadmium	mg/kg	1	**32.9** ENJ	**34.5** N*J	**8.2** EN*J	**10.6** N*J	**11.1** N*J	**24.2**	**6.0**	**26.8**
Calcium	mg/kg	10845	**69118**	**22655**	**28207**	**59866**	**26246**	**32900** G	**24600** G	**23800** G
Chromium	mg/kg	10	**4265**	**76** N*J	**65** N*J	**15** N*J	**30** N*J	**2060**	**3930**	**50**
Cobalt	mg/kg	8.55	**16.1** BNJ	5.8 BNJ	5.0 BNJ	6.4 BNJ	5.3 B	8.5 B	**12.5** B	
Copper	mg/kg	18.45	**3273**	**105**	**42**	18	**42**	**990**	**1080**	**62**
Iron	mg/kg	2000	**39078**	**54497** *J	**12712**	**17484** *J	**17329** *J	**19400**	**28400**	**32200**
Lead	mg/kg	18.75	**418** NJ	**79** N*J	**30** N*J	**22** N*J	**101** N*J	**240**	**310**	**54**
Magnesium	mg/kg	6580	**23336**	1645	3930	**15410**	6507	**10600**	**9220**	5670
Manganese	mg/kg	492	**549** NJ	**1922** N*J	162 N*J	**559** N*J	339 N*J	256	259	**600**
Mercury	mg/kg	0.1	**0.40**				**0.15**	**0.67**	**0.87**	
Nickel	mg/kg	13	**1205**	**49**	**36**	**15**	**29**	**875**	**1400**	**30**
Potassium	mg/kg	903.5	**2722**	672 B	**1117** BE	**2463** EJ	**1004** B	**995** B	386 B	548 B
Selenium	mg/kg	2						**15.0** N	**10.7** N	**8.1** N
Silver	mg/kg	1.1	**5.1** BNJ					**10.1**	**5.4**	
Sodium	mg/kg	108.25	**1972** B	**950** BJ	**1094** B	**1053** B	**997** B			
Thallium	mg/kg	1.1		**2** BNJ				**4** N	**4** N	
Vanadium	mg/kg	21.15	**46.3** EJ	12.1	15.0 E	**23.9**	13.1 B	11.8 B		12.5 B
Zinc	mg/kg	20	**1325**	**166** NJ	**130** ENJ	**289** NJ	**231** NJ	**635** E	**632** E	**470** E
Other Parameters										
Cyanide	mg/kg		50.8	0.9	1.2	1.7	1.0	67.9	12.7	22.6
Solids	%		39	88	68	81	69	61	55	63
Total VOCs	ug/kg	10	**227**	**42**	**202**	**53**	**199667**	**2216**	**1973**	**10491**
Total SVOCs	ug/kg	500	**249200**	**9200**	**19000**	**10650**	**35700**	**33700**	**29220**	**2842**
Total PCBs	ug/kg		420000	87	950	130	2300	74000	180000	0

Footnote:

1. Shaded, boldface values exceed TAGM 4046 Cleanup Standards for Soil.
2. SS-40 and SS-41 were collected for site background data. TAGM 4046 Cleanup Standards for Metals in soils were based on the average of these two values or the value provided, whichever was more conservative.

Organic Qualifiers:

B - Indicates compound was found in the associated blank as well as in the sample.
D - Indicates compound identified in analysis at secondary dilution factor.
E - Indicates compounds whose concentrations exceeded the calibration range.
G - Indicates compound concentration considered estimated based on review of data.
J - Indicates an estimated value.
N - Indicates a spike sample recovery was not within the control limits.
NA - Indicates not analyzed.
P - Indicates there was a greater than 25% difference between the two GC column results for a pesticide/Aroclor. The lower value is reported

Inorganic Qualifiers:

B - Indicates compound concentration was more than or same as the instrument detection limit, but less than the contract required limit.
E - Indicates compound concentration is an estimated value or not reported due to the presence of interference.
G - Indicates compound concentration considered estimated based on review of data.
J - Indicates an estimated value.
N - Indicates a spike sample recovery was not within the control limits.
* Indicates duplicate analyses were not within the control limits.

landfill. Again, it is likely that these elevated concentrations of metals in this area are the result of historical waste disposal in the area rather than an upstream source.

It is important to note that while the subsurface soil samples collected adjacent to the former sanitary sewer contained elevated levels of certain contaminants, there was no evidence of coarse-grained bedding material around the sewer. It appeared that the sewer was placed in native soils. Based on these direct visual observations, it appears unlikely that the materials surrounding the sewer has, or will act as a preferred pathway for contaminant migration. However, it is unknown whether the interior of the sewer can act as a pathway.

In addition to the test pits, samples were collected from two borings at varying depths and analyzed for inorganic compounds. Several of the metal concentrations exceeded the background values, but virtually all metal concentrations were within 1 to 2 times the background concentrations, except selenium which was approximately 3 times the background. These results are summarized in Table 4-9. The samples collected from these borings were only analyzed for total metals, ammonia, nitrate, total kjeldahl nitrogen, and standard plate count to determine the feasibility of using bioremediation as a remedial alternative for soil in the vicinity of MW-10. . Borings B-21 and B-22 were drilled in the middle of Ley Creek to determine if waste was present beneath the bed of the creek. No samples were analyzed from these two borings.

4.7 BIOTA SAMPLE RESULTS

The analytical results for earthworms are provided in Table 4-7. These results indicate that metals are the most common contaminant class in earthworms, with thirteen metals having been detected. These metals included aluminum, arsenic, cadmium, calcium, copper, iron, lead, manganese, mercury, potassium, selenium, sodium, and zinc. Only two SVOCs were detected: 4-methylphenol, a common laboratory contaminant, was detected at 1100 ug/kg, and di-n-butyl phthalate was detected at 170 ug/kg, dry weight. No PCBs were detected, but this analysis was performed well outside of the holding time. However, the PCB data are useable to indicate that elevated concentrations of PCBs were not detected in the samples. Since the earthworm samples were composited into one sample for analysis, no trends across the site could be established.

TABLE 4-9
TOWN OF SALINA LANDFILL
SUMMARY OF ANALYTICAL RESULTS FOR SUBSURFACE SOILS FROM BORINGS

Sample ID Sample Depth Lab Sample Number Sampling Date	Units	TAGM 4046 Cleanup Standard[1]	B-23 0-4 ft. 236699049 08/23/99	B-23 18-20 ft. 23699050 08/23/99	B-23 24-26 ft. 23699048 08/23/99	B-24 0-2 ft. 23699053 08/23/99	B-24 18-20 ft. 23699052 08/23/99	B-24 22-24 ft. 23699051 08/23/99
Metals								
Aluminum	mg/kg	10475	10300	4120	2640	7320	2180	1600
Antimony	mg/kg	1.625					**3.3** N	
Arsenic	mg/kg	1.1					**2.2** N	
Barium	mg/kg	61.85	**83.7**	55.3	37.9 B	51.4	25.7 B	23.6 B
Cadmium	mg/kg	1	**1.4**			**3.4**		
Calcium	mg/kg	10845	**36900** G	**571000** G	**36900** G	**40100** G	**36500** G	**39400** G
Chromium	mg/kg	10	**17.2**	**10.0**	5.4	**17.3**	3.9	3.2
Cobalt	mg/kg	8.55	**9.4** B	4.4 B		6.8 B		
Copper	mg/kg	18.45	**63.3**	10.6	11.7	**56.4**	11.3	**26.4**
Iron	mg/kg	2000	**18500**	**10600**	**6090**	**14600**	**6250**	**4900**
Lead	mg/kg	18.75	9.7	3.8	4.4	**26.8**	2.7	2.2
Magnesium	mg/kg	6580	**23500**	**13000**	**11100**	**19300**	**10800**	**8710**
Manganese	mg/kg	492	477	364	194	420	226	193
Nickel	mg/kg	13	**23.4**	10.9	7.4 B	**22.9**		
Potassium	mg/kg	903.5	**1550**	**1100**	598 B	**1350**	728 B	505 B
Selenium	mg/kg	2	**19.3** N	**18.5** N	**13.8** N	**19.3** N	**14.7** N	**14.5** N
Thallium	mg/kg	1.1		**2.7** N	**3.3** N		**2.9** N	**3.1** N
Vanadium	mg/kg	21.15	17.1	8.2 B		13.4		
Zinc	mg/kg	20	**46.0** E	**20.8** E	15.5 E	**102.0** E	15.0 E	13.0 E
Other Parameters								
Ammonia-Nitrogen	mg/kg		12 G		35 G	27 G	42 G	
Total Kjeldahl Nitrogen	mg/kg		540 G	140 G		710 G		
Standard Plate Count	col/g		354000	23000	100	71000	100	100
Percent Solids	%		92	92	87	93	90	89

Footnote:
1. Shaded, boldface values exceed TAGM 4046 Cleanup Standards for Soil.
2. SS-40 and SS-41 were collected for site background data. TAGM 4046 Cleanup Standards for Metals in soils were based on the average of these tow site background values or the value provided, whichever was more conservative.

Inorganic Qualifiers:
B - Indicates compound concentration was more than or same as the instrument detection limit, but less than the contract required limit.
E - Indicates compound concentration is an estimated value or not reported due to the presence of interference.
G - Indicates compound concentration considered estimated based on review of data.
N - Indicates a spike sample recovery was not within the control limits.

5.0 FATE AND TRANSPORT

This section provides a summary of the fate and transport of contaminants identified at the Town of Salina Landfill. The fate of contaminants refers to the group of processes that affect contaminants as they exist in various media. The fate of each contaminant varies according to the physical characteristics of the specific contaminant, although groups of contaminants often have similar fates. The physical characteristics of significance typically include density, vapor pressure, and solubility. The processes that affect contaminants include volatilization, photolysis, biodegradation, chemical speciation, bioaccumulation, sorption, among others.

The transport of contaminants is a function of not only the physical characteristics of the specific contaminant, but also of the characteristics of the media through which they are migrating. The characteristics of the media typically include viscosity, hyrdraulic conductivity, and porosity among others.

5.1 POTENTIAL MIGRATION PATHWAYS

Based on the results presented in Section 4, one primary source of contamination can be defined at the Town of Salina Landfill. Additionally, there are two secondary sources of contamination at the site. Contaminants from these source areas can then potentially migrate to other areas on site or off-site.

The primary source area for contamination is the waste within the landfill. While test pits revealed that as expected, much of the waste consisted of typical municipal solid waste, there was a black viscous material encountered in a number of locations that contained very high concentrations of PCBs, several VOCs and PAHs and a number of heavy metals (e.g., arsenic, barium, cadmium, chromium, lead, mercury, and zinc).

There are also two secondary sources of contamination at the landfill. These are defined as secondary because they were not necessarily associated with the placement of waste at the site. One secondary source of contamination is the surface soil cover over the waste. The soil cover typically should not have contained any contaminants, however some of the soil may have come from dredge spoils. The contaminants in the surface soil include primarily PAHs and a majority of the metals that were analyzed. The surface soil is largely absent of VOCs and is absent of PCBs, except for samples SS-15 and SS-16 collected along the south side of Ley Creek.

The other secondary source of contamination is the GM Facility located approximately 2 miles upstream of the site (O'Brien & Gere, 1999). Sediment sampling conducted in Ley Creek has demonstrated that PCBs and PAHs are present in significant concentrations upgradient of the site. These same contaminants are present in sediment samples collected from Ley Creek adjacent to the site.

Contaminants existing in the source areas may migrate to other areas or media on site or off site along various pathways. Without consideration of the actual amount of migration that actually occurs, the migration of contaminants from the primary source area, the subsurface waste, may occur directly through groundwater in the water table aquifer. There is no evidence that the waste materials are contributing to contamination of either air, or the groundwater in a deeper confined aquifer on site.

The transport of contaminants from surface soils may occur via two pathways: via leaching of contaminants from surface soils into groundwater and via physical erosion of soils into adjacent drainageways on site. Both pathways require precipitation events to initiate transport.

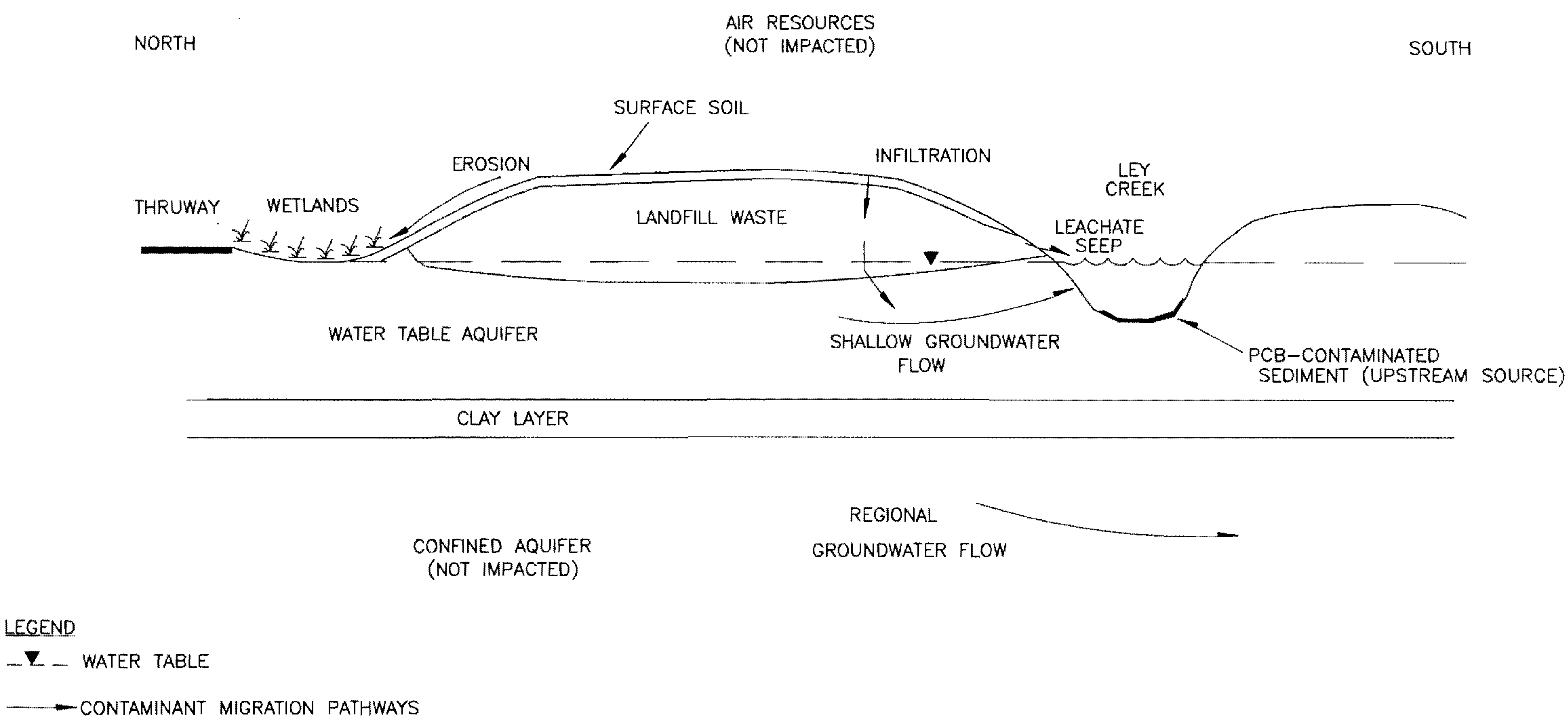
The transport of contaminants in sediments can occur along two pathways. As discussed above, a primary source of contaminated sediment in Ley Creek exists upstream of the site. Thus, some contaminants present in Ley Creek are not associated with the site. Contaminated sediment may also be transported to Ley Creek via the on-site drainageways.

The transport of contaminants in surface water can occur along four pathways: from upstream sources, from on-site drainageways, as shallow groundwater discharges into Ley Creek, and/or as leachate seeps that discharge into Ley Creek.

All of the potential migration pathways for contaminants detected at the site are depicted in Figure 5-1.

5.2 CONTAMINANT TRANSPORT

As discussed at the beginning of this section, the fate and transport of contaminants depends both on the physical characteristics of the contaminants, as well as the media through which they are migrating. By combining site-specific information on the characteristics of the various media, with information on the physical characteristics of the contaminants, a more defined model of contaminant transport can be developed.



NOT TO SCALE

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ENGINEERS, SURVEYORS, PLANNERS & LANDSCAPE ARCHITECTS

Lawler, Matusky & Skelly Engineers, LLP
Environmental Science & Engineering Consultants

FIGURE 5-1
CONCEPTUAL CONTAMINANT MIGRATION PATHWAYS
TOWN OF SALINA LANDFILL RI/FS

Testing of the existing surface soil cover showed that it has a relatively low permeability (maximum permeability of 9.32 x 10^{-5} cm/sec). The results of the permeability testing is included in Appendix B-3. This would limit the amount of infiltration through the surface soil to the waste below. Additionally, the entire site is vegetated and the adjacent on site drainageways are bordered by wetlands and do not have well-defined channels (with the exception of the channel near the northeast corner of the site). The vegetation would tend to limit erosion of the surface soil cover while the wetlands would tend to baffle surface water runoff from the site. The predominant contaminants in the surface soils include PAHs and metals. The PAHs as a group tend to be relatively insoluble which is borne out in the surface water and groundwater results as neither media contain PAHs in significant concentrations. In fact, PAHs are completely absent from the surface water and present in one groundwater sample at a total concentration of 2 μg/l. In summary, although contaminant migration pathways from surface soil to other media potentially exist, the site-specific data indicates that the surface soils do not generally contribute to contamination of other media.

The primary migration pathway for transport of contaminants from the subsurface waste is through groundwater, however this pathway is limited to certain contaminants. It is important to note that at least some of the waste is below the water table facilitating transport of contaminants from the waste to groundwater. This situation probably drives the production of leachate, rather than infiltration of precipitation through the surface soils and the waste. As with the surface soil, the subsurface waste contained PAHs, which as indicated above, are generally insoluble and are absent from the groundwater. Given the characteristics of the subsurface waste, we are assuming that the PAHs in the waste are inherent to the waste and are not an artifact of migration from the surface soils. PCBs are also present in the subsurface waste in high concentrations, and like PAHs, are relatively insoluble. PCBs were detected in 6 of the 17groundwater samples collected in concentrations ranging from 0.18 to 1.5 μg/l. These relatively low concentrations reflect the low solubility of PCBs; however the concentrations exceed groundwater standards. VOCs were also detected in the subsurface waste samples. VOCs as a group tend to be much more soluble in water and this appears to be reflected in the sampling results. While VOCs were either totally absent or detected in concentrations below groundwater standards in 8 of the 17 samples collected, the other 9 wells sampled did contain VOCs in excess of standards. The subsurface waste also contains a number of heavy metals. However, of the heavy metals in groundwater, only arsenic, barium cadmium, chromium, and lead are present above standards. Arsenic was detected is in excess of the groundwater standard of 25 μg/l in samples MW-6 (73.6 μg/l) and MW-9 (40.1 μg/l). Barium is present above the groundwater standard of 1,000 μg/l in sampleMW-10 (1,667 μg/l) and cadmium is present above standards in a number of samples.

However, the cadmium concentrations in the downgradient samples are similar to that in the upgradient sample, MW-0. Chromium was detected above the standard of 50 µg/l in samples MW-6 (143.1 µg/l), MW-9 (55.2 µg/l) and MW-10 (309 µg/l). Lead was detected above the groundwater standard of 25 µg/l in samples MW-1 (27.4 µg/l) and MW-15 (52.2 µg/l). In summary, the subsurface waste appears to be contributing to the contamination of VOCs and PCBs (in low concentrations) in groundwater.

Contaminants may migrate along several pathways into surface water. As was discussed above, both leachate and groundwater discharge into Ley Creek. Two VOCs are present in leachate; chlorobenzene and benzene. These same VOCs are present in groundwater, apparently confirming that the leachate seeps occur as groundwater discharges at land surface. However, the concentration of these VOCs is relatively low in the leachate and are completely absent in surface water. The absence of these VOCs in the surface water samples could be attributed to volatilization or to dilution. The same situation occurs with SVOCs as several compounds are present in groundwater and leachate in low concentrations, but are absent from surface water. In this case, the absence of SVOCs is likely due to dilution. With respect to PCBs, the groundwater and leachate both contain low concentrations of Aroclor 1248, which is also present in 2 surface water samples. However, it should be noted that all samples in which Aroclor 1248 is detected in groundwater, leachate, and surface water samples, the concentrations exceed the New York State standards. Because PCBs are absent in the upgradient surface water sample, it must be assumed that the PCBs in the surface water migrate from the subsurface waste, through the groundwater and leachate.

As was mentioned above, the primary contaminants in the sediment are PAHs, PCBs, and heavy metals. While the migration of PCBs from the subsurface waste through groundwater to surface water seems likely, the migration of PCBs in sediment is probably largely from the upstream source. The primary evidence for this is that the upgradient sample, SED-20 contains the highest concentration of PCBs of all the sediment samples but one. The one sample with a higher concentration was sample SED-22D. Since this sample was collected at the 6-12" interval, it suggests that the PCB concentrations are a result of historical transport from an upstream source. The presence of the PAHs in sediment would also appear to originate from an upstream source as PAHs are absent from groundwater, leachate, and surface water.

6.0 HUMAN HEALTH RISK ASSESSMENT

As part of the RI, Lawler, Matusky & Skelly Engineers LLP (LMS), as a subconsultant to CHA, has prepared a human health risk assessment that involved the following steps:

- Identification of potential contaminants of concern (COCs) for the site;
- Completing an exposure assessment (i.e., qualitative and quantitative analyses of exposure pathways) for the site;
- Conducting toxicity assessment/hazard identification for the selected COCs; and
- Risk Characterization.

This risk assessment also presents a qualitative evaluation of the uncertainty involved in the exposure assessment process. Results of this human exposure assessment will be used to help determine the need for remedial action at the site and to help select site remedial action options, if necessary.

In accordance with EPA risk assessment guidance (EPA 1989, 1991a, 1991b, and 1997c), the 1998 and 1999 data were not combined with historical environmental data from previous investigations at the site. Historical data (i.e., data generated from sampling events conducted prior to the CHA/LMS RI field work) were reviewed and qualitatively compared with data collected during this RI (1998 and 1999). Concentrations detected during this RI were found to be comparable or higher than the historical data. For on-site surface water and sediment in on-site drainageways, historic site data were analyzed along with the RI data for qualitative evaluation purposes.

6.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This section identifies applicable standards, criteria, and guidance that are used in the development of the human health risk assessment for the site. Applicable requirements are defined as those promulgated Federal or state requirements (e.g., drinking water standards or standards of control) that specifically address a hazardous substance, pollutant, or contaminant found at a Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site. Relevant and appropriate requirements are those Federal or state requirements that, while not directly applicable, address items that are sufficiently similar to those encountered at CERCLA sites. Collectively, these terms are commonly referred to as applicable or relevant and appropriate requirements, or ARARs. In addition to ARARs, other criteria, advisories, or guidance may apply to the conditions found at a site; these are referred to as to-be-considered (TBC) items. TBCs are not legally binding but may be useful in evaluating site risks and determining site cleanup goals.

In the New York State regulations (6 NYCRR Part 375), the equivalent term for "ARARs" is "standards and criteria" and the equivalent term for "TBCs" is "guidance". Within New York State regulations, these terms are grouped together and referred to as "standards, criteria, and guidance" or SCGs.

SCGs are generally divided into three item-specific categories: chemical, location, and action. Chemical-specific SCGs provide guidance on acceptable or permissible contaminant concentrations in environmental media such as soil, air, and water. Location-specific SCGs govern activities in critical environments such as floodplains, potable source aquifers, wetlands, endangered species habitats, or historically significant areas. Action-specific SCGs are technology- or activity-based requirements. The SCGs presented below in this chapter are of possible relevance to this human health risk assessment.

Some SCGs establish numerical values to limit the discharge or ambient concentration for a particular contaminant. In order to determine if a condition or activity complies with applicable SCGs, a list of specific COCs is organized based on site-specific environmental data.

6.1.1 Chemical-Specific SCGs

New York State Groundwater Standards (Class GA): The aquifer underlying the site is designated as a "Class GA" groundwater, which is described as follows: "The best usage of Class GA waters is as a source of potable water supply. Class GA waters are fresh groundwaters found in the saturated zone of unconsolidated deposits and consolidated rock or bedrock." Therefore, the Class GA groundwater standards are intended for protection of human health where groundwater is used as a drinking water. Numerical groundwater standards and guidance values are presented in 6 NYCRR Part 703 and NYSDEC's Division of Water (DOW) Technical and Operational Guidance Series (TOGS) 1.1.1 titled "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (NYSDEC 1998c). The Class GA groundwater standards are equivalent to criteria established by the New York State Department of Health (NYSDOH) for public water supplies. The NYSDOH criteria were promulgated in the New York Code of Rules and Regulations (NYCRR) Title 10 Chapter I (State Sanitary Code) subpart 5-1.

U.S. Environmental Protection Agency (USEPA) Drinking Water Standards: These federal standards include the Safe Drinking Water Act (SDWA) promulgated by the National Primary Drinking Water Standards (40 CFR Part 141) for the regulation of contaminants in all surface waters or groundwaters utilized as potable water supplies. The primary standards include both Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs). MCLs are enforceable standards for specific contaminants based on human health factors, and the technical and economic feasibility of removing the contaminants from the water supply. MCLGs are nonenforceable standards that do not consider the feasibility of contaminant removal. The SDWA also includes secondary MCLs (40 CFR Part 143) that are nonenforceable guidelines for those contaminants that may adversely affect the aesthetic quality of drinking water, such as taste, color, and odor. The constituents addressed in the SDWA are also addressed in the NYS groundwater standards.

New York State Groundwater Effluent Limitations (Class GA): The NYSDEC Division of Water (DOW) regulates point source discharges to Class GA groundwater primarily through the use of effluent limitations that have been established statewide. The effluent limitations are set at concentrations that should prevent contaminants from exceeding New York State ambient groundwater standards and guidance values. These numerical values are also presented in NYSDEC's TOGS 1.1.1 (NYSDEC 1998c).

Federal Ambient Water Quality Criteria: In accordance with Section 304(a) of the Clean Water Act, EPA has developed the Federal Ambient Water Quality Criteria (AWQC) for priority toxic pollutants. AWQCs are not legally enforceable, but may be referenced by states when developing enforceable water quality standards. AWQCs are available for both the protection of human health from exposure to contaminants in drinking water and for the protection of aquatic life.

New York State Surface Water Criteria: These standards and guidance values are set to protect the surface water quality of New York State water bodies. The values are derived according to the scientific procedures described in 6 NYCRR Part 702. Numerical surface water standards and guidance values are presented in 6 NYCRR Part 703 and NYSDEC's DOW Technical and Operational Guidance Series (TOGS) 1.1.1 titled "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (NYSDEC 1998c). Adjacent to the landfill, Ley Creek has been identified as a Class B surface water body by NYSDEC.

USEPA Generic Soil Screening Levels (SSLs): Generic soil screening levels (SSLs) were derived by USEPA using conservative default values and assumptions in standardized equations. The default values are likely to be protective for the majority of site conditions across the U.S. The Generic SSLs were used in this human health risk assessment to evaluate soils and sediment.

USEPA Region III Risk-Based Concentration (RBC) Table (October 5, 2000): This table provides risk-based concentrations (RBCs) for several potential exposure media (tap water, ambient air, fish, soil). The lower (i.e., more conservative) of the carcinogenic and noncarcinogenic values, as calculated using exposure variables and toxicity data, is presented in the table. The Region III RBCs were used to assess soils, sediments, groundwater, surface water, and leachate. Tap water RBCs were utilized to screen potential contaminants of concern in groundwater, surface water, and leachate. Industrial soil values were used to screen potential COCs in surface soil, subsurface soil, and sediment.

USEPA Region IX Preliminary Remediation Goals (PRGs): Preliminary Remediation Goals (PRGs) are tools developed by the USEPA for evaluating and remediating contaminated sites. PRGs are risk-based concentrations in environmental media (soil, water, air) derived from standardized equations, combining exposure information assumptions and USEPA toxicity data. The PRG values used in the human health risk assessment are generic (i.e., calculated without site-specific information). Region IX PRGs were used to evaluate soils, sediment, groundwater, surface water, and leachate. As appropriate, tap water PRGs were utilized to screen potential contaminants of concern in groundwater, surface water, and leachate. Industrial soil PRGs were used to evaluate potential COCs in surface soil, subsurface soil, and sediment.

New York State Recommended Soil Cleanup Objectives: These objectives have been prepared by NYSDEC in a revised Technical and Administrative Guidance Memorandum (TAGM #4046) issued on 24 November 1994. This guidance document outlines the basis and procedure for determining soil cleanup levels at state Superfund sites. Soil cleanup objectives are based on the protection of human health and groundwater quality, and are dependent on soil total organic carbon (TOC) content for organic compounds. TAGM #4046 also includes eastern U.S. native soil concentration ranges for metals.

HEAST and IRIS Tables. EPA's Health Effects Assessment Summary Tables (EPA, 1997b) and Integrated Risk Information System (IRIS, 2000) contain toxicity information used in risk assessment calculations, specifically in establishing the health risks of carcinogenic and noncarcinogenic chemicals. The IRIS database was accessed for this risk assessment from the Internet in December 2000.

Occupational Safety and Health Administration: The Occupational Safety and Health Administration (OSHA) has promulgated permissible exposure limits (PELs) for a variety of contaminants in air (29 CFR 1910, Subpart Z). The PELs are based on time-weighted average (TWA) concentrations to which workers may be exposed over an 8-hr exposure period without adverse effects. PELs and TWAs are intended for adult workers exposed in an occupational setting, and are not directly applicable to CERCLA or NYS inactive hazardous waste disposal sites. The PELs and TWAs may be used as guidance values to determine whether long-term exposures to contaminants in air during site activities may pose a human health risk.

National Institute for Occupational Safety and Health: The National Institute for Occupational Safety and Health (NIOSH) has developed concentrations for contaminants in the air that are immediately dangerous to life or health (IDLH) for individuals in occupational settings. The IDLH is the maximum concentration, in the event of respirator failure, that could be tolerated for 30-min without experiencing any escape-impairing or irreversible health effects. The IDLHs are appropriate only for subchronic exposures to noncarcinogenic compounds or effects of compounds in air. These values are not directly applicable to CERCLA or inactive hazardous waste disposal sites; however, they may provide guidance concerning the upper bound of safe inhalation exposures to contaminants for on-site workers during site activities. NIOSH has also established recommended exposure limits (RELs) for several contaminants. A REL is generally a time-weighted average based on toxicological and industrial hygiene data.

American Conference of Governmental Industrial Hygienists: The American Conference of Governmental Industrial Hygienists (ACGIH) has developed threshold limit values (TLVs) for contaminants in air that are updated annually. The TLV is a time-weighted average concentration under which most people can work consistently for 8 hours per day, over time, and receive no harmful effects. These values should be considered to protect on-site workers during site activities.

6.1.2 Action-Specific SCGs

The action-specific SCGs described below also pertain to the feasibility study part of this report.

Comprehensive Environmental Response, Compensation, and Liability Act: The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 was amended by the Superfund Amendment and Reauthorization Act (SARA) of 1986. CERCLA, specifically Section 121 (42 USC 9621, Cleanup Standards), states that the selected remedial alternative must attain a cleanup level that is protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The extent to which each of the remedial alternatives for the sites complies with this requirement will be assessed during the detailed evaluation of alternatives in the FS.

New York State Inactive Hazardous Waste Disposal Sites: 6 NYCRR Part 375 regulates the activities at inactive hazardous waste disposal sites. This regulation states that the selected remedy shall eliminate or mitigate all significant threats to public health and the environment presented by hazardous waste disposed at a site through the proper application of scientific and engineering principles. The extent to which each of the remedial alternatives for the sites complies with this requirement will be assessed during the detailed evaluation of alternatives.

Identification and Listing of Hazardous Waste/Resource Conservation and Recovery Act (RCRA). These regulations (6 NYCRR Part 371 and 40 CFR Part 268) establish procedures for identifying and listing solid waste as hazardous waste. Hazardous wastes are classified based on ignitability, reactivity, corrosivity, and toxicity. Soil, sediment, leachate, and groundwater removed from the ground may be considered characteristically hazardous based on the constituent concentrations found in representative samples. If concentrations exceed the regulatory level for toxicity characteristic, the waste is considered a characteristically hazardous waste and must be treated or disposed of as such. Table 6-1 summarizes some of the EPA classifications and regulatory levels for hazardous wastes that may exist at the site.

EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. This EPA guidance (EPA/540/G-89/004) establishes the methodology that the Superfund program has established for characterizing the nature and extent of the risks posed by uncontrolled hazardous waste sites and for evaluating potential remedial options (EPA 1988).

Risk Assessment Guidance for Superfund. The Risk Assessment Guidance for Superfund (Volume I, Parts A[1989], B[1991a], C [1991b], and D [1997c]) was developed by EPA to provide guidance for developing health risk information at Superfund sites and to support CERCLA's requirement to protect human health and the environment . This guidance was referenced in preparing the human health risk assessment for the site.

TABLE 6-1
TOWN OF SALINA LANDFILL
MAXIMUM TOXICITY CHARACTERISTIC CONCENTRATIONS

EPA Hazardous Waste Number	Contaminant	RCRA Hazardous Waste Criteria* (mg/l)
D004	Arsenic	5.0
D006	Cadmium	1.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D043	Vinyl Chloride	0.2

* - 40 CFR part 261, subpart C

6.2 EXPOSURE PATHWAY ANALYSIS

The purpose of the exposure assessment is to identify the exposure pathways by which humans may contact the site COCs and to estimate the exposure concentrations and chemical intakes for each of the pathways and contaminants.

EPA guidance for exposure assessment recommends a three-step process:

1. Characterization of the exposure setting, including a description of the physical environment and identification of potentially exposed receptors.

2. Identification of sources, exposure points, and exposure routes (e.g., ingestion, dermal contact). The combination of these three items is needed in order for an exposure pathway to be "complete."

3. Quantification of exposure, which involves combining exposure point concentrations and exposure variables (body weight, ingestion rate, frequency and duration of exposure, etc.)

This section discuss the exposure setting and identification and screening of exposure pathways (i.e., steps 1 and 2). The calculation of exposure concentrations for the COCs in site media and the estimation of chemical intakes for the retained exposure pathways are included in Section 6.4 below.

6.2.1 Exposure Setting

The landfill is located in a commercial and industrial zone of the Town of Salina. The landfill is zoned industrial, while a strip of land along Route 11 is zoned commercial. Surrounding the landfill is the NY State Thruway to the north, Route 11 to the east, an active line of Conrail railroad tracks to the south and the OCRRA Solid Waste Transfer Station to the west. The nearest residential areas are single family homes located north of the site, approximately 600 feet immediately across the Thruway. Residential areas also exist east of the site. All other adjoining land is zoned commercial or industrial, has been developed, and is being used for these purposes. The nearest location of sensitive receptors is a private elementary school located approximately one mile north of the site, along Route 11. Primary access to the landfill is through two gates along Route 11. The dirt roads and paths that wind around the landfill indicate that some trespassing does occur.

Ley Creek, which flows approximately east to west across the southern portion of the site, also provides access to the site. There were no footpaths observed along its bank, indicating that the Creek in the site vicinity generally is not used for recreation. No fishing, boating, or other recreational activities were observed in or along Ley Creek during site inspections. Daily average annual flow for Ley Creek is 44.5 cubic feet per second (USGS Station 04240120, Ley Creek at Park Street). Thus, near the site, Ley Creek is assumed to be large enough for canoeing but too small for motor boats. The creek has been completely channelized and is not well-suited for recreational boating, swimming, or fishing. Thus, human exposures to sediment and surface water at the site are typically not considered to be high.

The landfill has dense vegetation consisting of wetlands, grass fields, and wooded undergrowth. The landfill reportedly was covered with soil in 1982 and has remained unchanged since that time. Current usage is limited to persons trespassing in the open areas offered by the landfill. There are no buildings or other structures on the landfill. Thus, there is no exposure to vapors in enclosed spaces.

There are no drinking water wells or agricultural/industrial water supply wells located on-site. While there is no master plan in place at the present time, the town does not have any plans to change industrial-zoned land use areas, including the site. Therefore, it is highly unlikely that any future use of the landfill would involve sensitive human exposure pathways, such as residential endpoints and potable water routes of exposure. Off-site exposure to degraded groundwater is considered unlikely. All potable drinking water supplied to the surrounding industrial/commercial areas and residents is from an off-site municipal source unaffected by the site.

6.2.2 Identification and Screening of Exposure Pathways

An exposure pathway consists of a source and mechanism of contaminant release, a receiving matrix, a point of potential human contact with the contaminated matrix (i.e., exposure point), and an exposure route (i.e., inhalation, ingestion, or dermal contact). If an exposure pathway is not complete because it does not include a receiving matrix, a point of potential human contact, or an exposure route, then no risk exists. For current and future land use scenarios, only exposure pathways that potentially exist on-site are discussed in this risk assessment; off-site pathways are not included. As mentioned, it is anticipated that in the future the land will be zoned as it is at present (i.e., industrial).

The pathways have been arranged for the current and future land use scenarios according to the receiving media (e.g., surface soils, groundwater) that were determined to be contaminated based on results from the RI. Exposure points and routes by which humans may realistically encounter the COCs on-site in the receiving media are also identified. The potential exposure pathways were then evaluated (screened) to identify complete pathways. The results of the screening of the potential exposure pathways are included in Table 6-2 and are discussed below by land use scenario.

As previously agreed upon, potential sediment and surface water exposures from on-site drainageways/ditches and Ley Creek were not quantitatively assessed. Rather, qualitative discussions of possible exposure pathways associated with sediment and surface waters from on-site drainageways (not Ley Creek) are provided below. Historic data was utilized for these discussions. In addition, potential sediment and surface water COCs were identified using the 1998 and 1999 RI data (see Section 6.3 below), utilizing data from both the on-site drainageways and Ley Creek, as previously agreed upon.

Current Land Use Scenario: Potential air exposure pathways include the inhalation of contaminants adsorbed onto fugitive dust particles. Inhalation exposure to volatilized contaminants was not considered as a potential exposure pathway at the site because no VOCs were identified as COCs in surface soil, sediment, or surface water. Inhalation of contaminants adsorbed onto fugitive dusts was not retained as a potential exposure pathway as vegetation covers the majority of the landfill surface and the generation of fugitive dusts are minimal.

Surface Soils/Subsurface Soils

Ingestion of and dermal contact with contaminated surface soils have been retained as potential exposure routes for on-site trespassers. Consumption of wildlife or vegetation that may be affected by on-site surface soil contamination was not evaluated in this risk assessment; only potential exposures to chemical contamination were evaluated. Both adults and children were considered as receptors for this risk assessment. Although subsurface soils at the site are also contaminated, there is no current exposure point for human contact with this medium. Therefore, the exposure pathways associated with subsurface soils have been eliminated from further consideration for the current land use scenario.

Groundwater

Contamination has been identified in the groundwater beneath the landfill; however, there are currently no documented users of on-site groundwater. In addition, all homes and businesses in the site vicinity are connected to an off-site public water supply that is unaffected by the site

TABLE 6-2
TOWN OF SALINA LANDFILL
SELECTION OF EXPOSURE PATHWAYS

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil	Surface Soil	On-Site	Trespasser	Adult	Dermal	On-Site	Quant	Historic waste disposal and surface runoff, tracking, and spills have created COCs in this medium. Pathways retained for further analysis.
						Ingestion	On-Site	Quant	
					Child	Dermal	On-Site	Quant	Historic waste disposal and surface runoff, tracking, and spills have created COCs in this medium. Pathways retained for further analysis.
						Ingestion	On-Site	Quant	
		Air	On-Site	Trespasser	Adult	Inhalation	On-Site	none	On-site area is mostly vegetated; generation of fugitive dusts expected to be minimal. No VOCs were identified as COCs in surface soils. Pathway excluded from further analysis.
					Child	Inhalation	On-Site	none	On-site area is mostly vegetated; generation of fugitive dusts expected to be minimal. No VOCs were identified as COCs in surface soils. Pathway excluded from further analysis.
	Subsurface Soil	Subsurface Soil	On-Site	Trespasser	Adult	Dermal	On-Site	none	Although potential COCs exist in subsurface soil, no significant exposure routes were identified in the current land use scenario. Pathways excluded from further analysis.
						Ingestion	On-Site	none	
					Child	Dermal	On-Site	none	Although potential COCs exist in subsurface soil, no significant exposure routes were identified in the current land use scenario. Pathways excluded from further analysis.
						Ingestion	On-Site	none	
	Groundwater	Groundwater, Air	None	NA	NA	NA	none	none	There are no potable wells or industrial/agricultural wells at the site. All potable water supplied to the surrounding area is from an off-site municipal source that is unaffected by the site. No on-site exposure points for human contact with on-site groundwater was identified in the pathway analysis. Pathways excluded from further analysis.
	Sediment (on-site drainageways)	Sediment	On-Site (drainageways)	Trespasser	Adult	Dermal	On-Site	Qual	Qualitative discussion provided in text for exposures to sediments in on-site drainageways. Ley Creek sediments not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
						Ingestion	On-Site	Qual	
					Child	Dermal	On-Site	Qual	Qualitative discussion provided in text for exposures to sediments in on-site drainageways. Ley Creek sediments not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
						Ingestion	On-Site	Qual	
		Air	On-Site	Trespasser	Adult	Inhalation	On-Site	none	No VOCs were identified as COCs in sediments. Pathway excluded from further analysis.
					Child	Inhalation	On-Site	none	No VOCs were identified as COCs in sediments. Pathway excluded from further analysis.
	Surface Water (on-site drainageways)	Surface Water	On-Site (drainageways)	Trespasser	Adult	Dermal	On-Site	Qual	Qualitative discussion provided in text for exposures to surface wate in on-site drainageways. Ley Creek surface water not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
						Ingestion	On-Site	Qual	
					Child	Dermal	On-Site	Qual	Qualitative discussion provided in text for exposures to surface wate in on-site drainageways. Ley Creek surface water not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
						Ingestion	On-Site	Qual	
		Air	On-Site	Trespasser	Adult	Inhalation	On-Site	none	No VOCs were identified as COCs in surface water. Pathway excluded from further analysis.
					Child	Inhalation	On-Site	none	No VOCs were identified as COCs in surface water. Pathway excluded from further analysis.

TABLE 6-2
TOWN OF SALINA LANDFILL
SELECTION OF EXPOSURE PATHWAYS

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Leachate	Leachate	On-Site	Trespasser	Adult	Dermal	On-Site	Quant	Historic waste disposal, other contaminated media, leaching/migration of contamination, and spills have created COCs in this medium. Pathways retained for further analysis.
						Ingestion	On-Site	Quant	
					Child	Dermal	On-Site	Quant	Historic waste disposal, other contaminated media, leaching/migration of contamination, and spills have created COCs in this medium. Pathways retained for further analysis.
						Ingestion	On-Site	Quant	
		Air	On-Site	Trespasser	Adult	Inhalation	On-Site	none	Only two VOCs identified as COCs in leachate. Pathway excluded from further analysis.
					Child	Inhalation	On-Site	none	Only two VOCs identified as COCs in leachate. Pathway excluded from further analysis.
Future	Surface Soil	Surface Soil	On-Site	Trespasser	Adult	Dermal	On-Site	Quant	Historic waste disposal and surface runoff, tracking, and spills have created COCs in this medium. Pathways retained for further analysis.
						Ingestion	On-Site	Quant	
					Child	Dermal	On-Site	Quant	Historic waste disposal and surface runoff, tracking, and spills have created COCs in this medium. Pathways retained for further analysis.
						Ingestion	On-Site	Quant	
				Construction Worker	Adult	Dermal	On-Site	Quant	Historic waste disposal and surface runoff, tracking, and spills have created COCs in this medium. Individual conducting future site work may be exposed to surface soil contaminants. Pathways retained for further analysis.
						Ingestion	On-Site	Quant	
		Air	On-Site	Trespasser	Adult	Inhalation	On-Site	none	On-site area anticipated to remain mostly vegetated; generation of fugitive dusts expected to be minimal. No VOCs were identified as COCs in surface soils. Pathway excluded from further analysis.
					Child	Inhalation	On-Site	none	On-site area anticipated to remain mostly vegetated; generation of fugitive dusts expected to be minimal. No VOCs were identified as COCs in surface soils. Pathway excluded from further analysis.
				Construction Worker	Adult	Inhalation	On-Site	none	On-site area anticipated to remain mostly vegetated; generation of fugitive dusts expected to be minimal. No VOCs were identified as COCs in surface soils. Pathway excluded from further analysis.
	Subsurface Soil	Subsurface Soil	On-Site	Trespasser	Adult	Dermal	On-Site	none	Although potential COCs exist in subsurface soil, no significant exposure routes were identified for trespassers in the future land use scenario. Pathways excluded from further analysis.
						Ingestion	On-Site	none	
					Child	Dermal	On-Site	none	Although potential COCs exist in subsurface soil, no significant exposure routes were identified for trespassers in the future land use scenario. Pathways excluded from further analysis.
						Ingestion	On-Site	none	
				Construction Worker	Adult	Dermal	On-Site	Quant	Historic waste disposal, contaminant leaching/migration, and spills have created COCs in this medium. Individual conducting future site work may be exposed to subsurface soil contaminants. Pathways retained for further analysis.
						Ingestion	On-Site	Quant	

TABLE 6-2
TOWN OF SALINA LANDFILL
SELECTION OF EXPOSURE PATHWAYS

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
	Groundwater	Groundwater	On-Site	Construction Worker	Adult	Ingestion	On-Site	Quant	Individual conducting future site work may be exposed to groundwater contaminants via incidental ingestion. Pathway retained for further analysis.
						Dermal	On-Site	none	It is surmised that appropriate protective clothing/equipment will be utilized by construction worker in the future so that dermal exposure pathway can be eliminated. Pathway thus excluded from further analysis.
		Air	On-Site	Construction Worker	Adult	Inhalation	On-Site	none	Potential exposure to groundwater COCs is anticipated to be of short duration for construction worker in the future. Thus, inhalation pathway not retained for further analysis.
	Sediment (on-site drainageways)	Sediment	On-Site (drainageways)	Trespasser	Adult	Dermal Ingestion	On-Site	Qual	Qualitative discussion provided in text for exposures to sediments in on-site drainageways. Ley Creek sediments not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
					Child	Dermal Ingestion	On-Site	Qual	Qualitative discussion provided in text for exposures to sediments in on-site drainageways. Ley Creek sediments not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
				Construction Worker	Adult	Dermal Ingestion	On-Site	Qual	Qualitative discussion provided in text for exposures to sediments in on-site drainageways. Ley Creek sediments not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
		Air	On-Site	Trespasser	Adult	Inhalation	On-Site	none	No VOCs were identified as COCs in sediments. Pathway excluded from further analysis.
					Child	Inhalation	On-Site	none	No VOCs were identified as COCs in sediments. Pathway excluded from further analysis.
				Construction Worker	Adult	Inhalation	On-Site	none	No VOCs were identified as COCs in sediments. Pathway excluded from further analysis.

TABLE 6-2
TOWN OF SALINA LANDFILL
SELECTION OF EXPOSURE PATHWAYS

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
	Surface Water (on-site drainageways)	Surface Water	On-Site (drainageways)	Trespasser	Adult	Dermal	On-Site	Qual	Qualitative discussion provided in text for exposures to surface wate in on-site drainageways. Ley Creek surface water not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
						Ingestion	On-Site	Qual	
					Child	Dermal	On-Site	Qual	Qualitative discussion provided in text for exposures to surface wate in on-site drainageways. Ley Creek surface water not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
						Ingestion	On-Site	Qual	
				Construction Worker	Adult	Dermal	On-Site	Qual	Qualitative discussion provided in text for exposures to sediments in on-site drainageways. Ley Creek sediments not included in exposure analysis as per previous agreement. Pathways excluded from quantitative analysis.
						Ingestion			
		Air	On-Site	Trespasser	Adult	Inhalation	On-Site	none	No VOCs were identified as COCs in surface water. Pathway excluded from further analysis.
					Child	Inhalation	On-Site	none	No VOCs were identified as COCs in surface water. Pathway excluded from further analysis.
				Construction Worker	Adult	Inhalation	On-Site	none	No VOCs were identified as COCs in surface water. Pathway excluded from further analysis.
	Leachate	Leachate	On-Site	Trespasser	Adult	Dermal	On-Site	Quant	Historic waste disposal, other contaminated media, leaching/migration of contamination, and spills have created COCs i this medium. Pathways retained for further analysis.
						Ingestion			
					Child	Dermal		Quant	Historic waste disposal, other contaminated media, leaching/migration of contamination, and spills have created COCs i this medium. Pathways retained for further analysis.
						Ingestion			
				Construction Worker	Adult	Dermal	On-Site	none	It is anticipated that leachate will be removed as needed prior to the commencement of future construction activities at the site. Thus, construction worker pathway excluded from further analysis.
						Ingestion			
		Air	On-Site	Trespasser	Adult	Inhalation	On-Site	none	Only two VOCs identified as COCs in leachate. Pathway excluded from further analysis.
					Child	Inhalation	On-Site	none	Only two VOCs identified as COCs in leachate. Pathway excluded from further analysis.
				Construction Worker	Adult	Inhalation	On-Site	none	Only two VOCs were identified as COCs in leachate. Pathway excluded from further analysis. In addition, it is anticipated that leachate will be removed as needed prior to the commencement of future construction activities at the site. Thus, construction worker pathway excluded from further analysis.

contamination; therefore, there is no currently existing exposure point for human contact with the contaminated groundwater. In addition, no private use wells were identified at the site. The potential exposure pathways related to on-site groundwater have thus been eliminated from further consideration in the current land use scenario.

Sediments

Potential exposure pathways associated with contaminated sediments in on-site drainageways have been retained for on-site trespassers. The potential exposure routes for contact with contaminated sediments in on-site drainageways include ingestion and dermal contact (no volatile COCs were noted). Both adults and children are considered as potential receptors for this contaminated medium. Consumption of fish or wildlife that may be affected by sediment contamination was not evaluated in this risk assessment. As previously agreed upon, sediments in Ley Creek are not further evaluated in this human health exposure pathway analysis.

A qualitative analysis of the potential on-site sediment exposure routes for the current land use scenario was conducted and is discussed here. No quantitative exposure assessment was conducted for on-site sediments, as previously agreed upon. As part of this analysis, RI and historic sediment data from the on-site drainageways were reviewed. EPA Generic SSLs were used to evaluate the levels that were detected in the sediment samples.

Sediments: Historic Data Review

In 1987, NUS collected one sediment sample from an on-site drainage ditch at the site (no additional information was found regarding this sample). Ecology & Environment Engineering, P.C. (E&E) collected five sediment samples from on-site drainageways (1993 – 1994). A map of the five on-site sediment locations (SED-5, SED-7, SED-8, SED-11, and SED-12) and a summary of this E&E data are provided in Chapter 1 of the RI report. VOCs were analyzed in all five of the drainageway sediment samples. Two VOCs were detected. Acetone was found in four out of five samples, at levels ranging from 84 – 170 ug/kg. Total 1,2 DCE was detected in one of the on-site sediment samples (5 ug/kg). These VOC concentrations were found to be well below EPA SSLs. SVOCs were analyzed for in three of the five sediment samples collected by E&E from on-site drainageways. Total PAHs were detected in all three samples (range of 530 –3000 ug/kg); no other SVOC was detected. As data for individual PAH constituents were not available, EPA Generic SSLs could not be used as a screening tool. Pesticides and PCBs were tested for in all five samples. Two pesticides, 4,4-DDD (26 ug/kg) and 4,4-DDT (40 ug/kg), were each found in sample (SED-12). The concentrations of both of these compounds were found to be below the respective EPA SSLs. No pesticides were detected in the other four sediment samples. PCBs were detected in three of the five samples. Aroclor 1242 was detected in SED-7 at a concentration of 370 ug/kg. Aroclor 1248 was found in samples SED-11 and SED-12 at levels of 770 and 7100 ug/kg, respectively. Aroclor 1254 was detected in the same two samples at 570 and 3100 ug/kg. The total PCB concentrations in SED-11 and SED-12 were thus above the EPA Generic SSL level of 1000 ug/kg. Metals were analyzed for in three of the five samples (SED-5, SED-7, and SED-8) collected by E&E. Several metals were detected; two metals (arsenic at SED-5 [40.9 mg/kg], SED-7 [4 mg/kg], and SED-8 [117 mg/kg] and antimony at SED-5 [91.5 mg/kg]) exceeded the EPA Generic SSL levels.

Two sediment samples from an on-site drainage ditch (SED-25 and SED-25D) were collected for the RI in 1998. Both samples were collected at a location along the NYS Thruway, as described in the RI, and analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. A review of the data from these two samples reveals that no parameters which were detected exceeded the EPA generic SSLs.

Reviews of RI and historic sampling events have identified a few potential COCs (PCBs, arsenic, antimony) associated with sediment in on-site drainageways. Each of these potential COCs was identified in the historic data sets using EPA Generic SSLs as a screening tool. In the current land use scenario, potential exposure pathways (incidental ingestion, dermal contact) exist for sediment in on-site drainageways. As no VOCs were identified as potential contaminants of concern, an inhalation exposure route was not identified for contaminants in on-site drainageway sediments. Possible receptors include child and adult trespassers.

<u>Surface Water</u>

The current land use exposure pathway associated with contaminated surface water in on-site drainageways was retained for on-site trespassers. The potential exposure routes for contact with these contaminated surface waters include ingestion and dermal contact. No VOCs were identified as COCs in this matrix. Both adults and children were considered as possible receptors in the risk assessment. Consumption of fish or wildlife that may be affected by surface water contamination was not evaluated as an exposure. As previously agreed upon, surface water in Ley Creek is not evaluated in this human health exposure pathway analysis.

A qualitative analysis of the potential on-site surface water exposure routes for the current land use scenario was conducted and is discussed here. No quantitative exposure assessment was conducted for on-site surface water, as previously agreed upon. As part of this analysis, RI and historic surface water data from the on-site drainageways was reviewed. EPA Region III Tap Water RBCs were used as a screening tool to evaluate the levels that were detected in the surface water samples.

Surface Water: Historic Data Review

In 1986, the NYSDEC collected three surface water samples from drainage ditches near the thruway and analyzed them for PCBs. No PCBs were detected in any of the three samples. One surface water sample was collected from an on-site drainage ditch in 1987 by NUS (no additional information was found regarding this sample).

E&E collected five surface water samples from on-site drainageways (1993 – 1994). A map of the five on-site surface water locations (SW-5, SW-7, SW-8, SW-11, and SW-12) and a summary of this data from E&E are provided in Chapter 1 of the RI report (locations coincide with five E&E sediment samples discussed above). VOCs, SVOCs, pesticides, and PCBS were analyzed for in all five of the surface water samples collected from on-site drainageways. Metals were analyzed for in three of the five samples (SW-5, SW-7, and SW-8). Five VOCs were detected (acetone, carbon disulfide, total 1,2-DCE, 1,2-DCA, and 1,1,1-TCA) in three of the samples. All concentrations were below the tap water RBCs, except for 1,2-DCA which was found at a level of 7 ug/l in sample SW-5. No SVOCs, pesticides, or PCBs were detected in any of the five E&E on-site drainageway surface water samples. Several metals were detected in the three surface water samples that were analyzed for metals. Using the EPA Tap Water RBCs as a screening tool, elevated levels of arsenic (detected in three samples, with concentrations ranging from 5.8 – 20.8 ug/l) and barium (3420 ug/l) were found.

One surface water sample from an on-site drainage ditch (SW-25) was collected for the RI in 1998 (same location as SED-25/D). This sample was located along the NYS Thruway, as described in the RI, and analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. A review of the data from this sample reveals that no parameters which were detected exceeded the EPA Region III Tap Water RBCs.

Reviews of RI and historic sampling events have identified a few potential COCs (1,2-DCA, arsenic, barium) associated with surface water in on-site drainageways. Each of these potential COCs was identified in the historic data sets using EPA Region III RBCs for tap water as a screening tool. In the current land use scenario, potential exposure pathways (incidental ingestion, dermal contact) exist for surface water in on-site drainageways. However, it should be noted that the exposure route is not permanent, since standing water is typically present in the on-site drainageways only after precipitation events and during certain times of the year. As only one VOC was identified as potential contaminants of concern (minimal exceedance of screening criterion), an inhalation exposure route of significance was not identified for contaminants in on-site drainageway sediments. Possible receptors include child and adult trespassers.

Leachate

Contaminated leachate has been identified at the site. Ingestion of and dermal contact with contaminated leachate have been retained as potential exposure routes for on-site trespassers. Since relatively low levels of only two VOCs (benzene, 4.7 ug/l and 1,4-dichlorobenzene, 3 ug/l; see Section 6-3, below) were found in on-site leachate, a potential inhalation exposure route was not evaluated in this risk assessment. Consumption of wildlife or vegetation that may be affected by on-site leachate contamination was not evaluated in this risk assessment; only potential exposures to chemical contamination were evaluated.

Future Land Use Scenario: For this risk assessment, it was assumed that the current land use will extend into the future (i.e., landfill). While there is no master plan in place at the present time, the town does not have any plans to change current land uses, including the landfill, from industrial. Therefore, it is highly unlikely that any future use of the landfill would involve sensitive human exposure pathways, such as residential endpoints and potable water routes of exposure. As with the current land use scenarios, consumption of fish, wildlife, or vegetation that may be affected by on-site contamination was not assessed.

The volatilization of contaminants to air exposure pathway was eliminated from further consideration as an exposure pathway because the COCs in on-site surface soils, sediments, and surface water are not volatile (see Section 6-3). Inhalation of contaminants adsorbed onto fugitive dusts was not retained as a potential exposure pathway in the future land use scenario, as it is anticipated that the majority of the landfill surface will remain vegetated and dust generation will be minimal. It is possible that fugitive dusts may be generated in the future during the implementation of institutional measures or other soil disturbance activities; however, it is assumed that any potential exposures will be short-term in nature.

Surface Soils/Subsurface Soils

In the future land use scenario, ingestion of and dermal contact with contaminated surface soils have been retained as potential exposure routes for on-site trespassers and construction workers. Ingestion of and dermal contact with contaminated subsurface soils have also been retained as potential exposure routes for construction workers in the future land use scenario.

Groundwater

Groundwater exposure pathways for trespassers or users of potable water were not included for further consideration in the future as it is assumed that there will be no future exposure point for human contact with on-site groundwater (i.e., it is assumed that potable water will be continued to be supplied to the site area from an off-site, unaffected source). Because of the groundwater concentrations of COCs in exceedance of health-based criteria, future approval would likely not be granted by NYSDEC for installation of potable (or other use) groundwater wells at the site. Thus, considering this information regarding future site uses and previous agreements reached for this risk assessment, potable water exposure pathways were not considered in the future land use scenario.

As with other on-site media, short-term exposures to contaminated groundwater may exist for construction workers in the future via incidental ingestion. It is assumed that appropriate protective clothing/equipment will be used by construction workers at the site in the future such that any dermal contact with contaminated groundwater will not exist. Thus, the dermal exposure pathway was not evaluated. In addition, possible future construction worker exposures to contaminated groundwater are expected to be very limited in duration, so the inhalation route of exposure was also not evaluated.

<u>Sediments</u>
Potential exposure pathways associated with contaminated sediments in on-site drainageways have been retained for construction workers and trespassers under the future land use scenario. The potential exposure routes for contact with these sediments include dermal contact and ingestion (no volatile COCs were identified in sediments). As in the current land use scenario, and as previously agreed upon, both adult and children trespassers were considered as receptors, and Ley Creek sediment was not evaluated. A qualitative discussion of potential sediment exposure pathways is included below for the future land use scenario. A discussion of RI and historic data for sediment samples in on-site drainageways is provided above under the current land use scenario. No quantitative exposure assessment for on-site sediments was conducted, as per previous agreements.

In the future land use scenario, potential exposure pathways (incidental ingestion, dermal contact) exist for sediment in on-site drainageways, as it is assumed that the on-site ditches and drainageways will continue to exist and function at the site. As no VOCs were identified as potential contaminants of concern, an inhalation exposure route was not identified for contaminants in on-site drainageway sediments. Possible receptors include child and adult trespassers and construction workers who may perform site work in the future.

<u>Surface Water</u>
Similarly, the exposure pathway associated with contaminated surface water from on-site drainageways was retained for the future land use scenario. Potential exposure routes include ingestion and dermal contact. No VOCs were identified as contaminants of concern in on-site

surface water. Both adult and children trespassers, along with construction workers, were considered as possible future receptors. As in the current land use scenario, and as previously agreed upon, surface water from Ley Creek was not evaluated. A qualitative discussion of potential surface water exposure pathways is included below for the future land use scenario. A discussion of RI and historic data for surface water samples in on-site drainageways is provided above under the current land use scenario. No quantitative exposure assessment for on-site surface water was conducted, as per previous agreements.

In the future land use scenario, potential exposure pathways (incidental ingestion, dermal contact) exist for surface water in on-site drainageways as it is surmised that on-site ditches/drainageways will exist and function at the site into the future. However, it should be noted that the exposure route may not be permanent, since standing water is typically present in the on-site drainageways only after precipitation events and during certain times of the year. As no VOCs were identified as potential contaminants of concern, an inhalation exposure route was not identified for contaminants in surface water from on-site drainageways. Possible receptors include child and adult trespassers and construction workers that may conduct site work in the future.

<u>Leachate</u>

Potential exposure pathways associated with contaminated leachate were retained for trespassers (children and adults) in the future land use scenario. The dermal contact and incidental ingestion exposure routes were evaluated. Since relatively low levels of only two VOCs were found in on-site leachate during the RI, a potential inhalation exposure route was not evaluated in this risk assessment. These pathways were not evaluated for construction workers since it is surmised that leachate will be adequately contained or removed prior to any future construction activities in designated on-site areas.

6.3 IDENTIFICATION OF POTENTIAL CONTAMINANTS OF CONCERN

Tables that evaluate potential contaminants of concern in each environmental media investigated at the site were assembled using the 1998 and 1999 data set. Frequency of detection, minimum values, and maximum values were determined for each analyte in each matrix. Only chemicals that were detected or estimated are included in the tables, while chemicals that were not detected in any sample of a particular medium (or were found in less than 5% of the sample set) have been excluded from these tables, in accordance with EPA guidance. All tentatively identified compounds (TICs) were eliminated from further consideration, as these compounds were not positively identified. In general, TICs detected in on-site media were present at low concentrations and were not assumed to pose a significant risk to humans.

The selection of chemicals of concern is necessary to appropriately focus the risk assessment on dominant chemicals in accordance with EPA guidance. Procedures used to select potential chemicals of concern for the landfill were as follows:

1. Chemical concentrations for each matrix were compared to applicable standards. The maximum concentration for each analyte was used as the screening value. Soil data were compared with USEPA Region III RBCs (industrial values), USEPA Generic SSLs, and USEPA Region IX PRGs (industrial values). Groundwater data were evaluated against USEPA Region III RBCs and Region IX PRGs (tap water criteria). Sediment concentrations were compared with USEPA Region III RBCs (industrial), USEPA Generic SSLs, and Region IX PRGs (industrial). Surface water and leachate concentrations were compared to USEPA Region III RBCs and Region IX PRGs criteria (tap water).

   Chemicals with concentrations that exceeded a standard were given higher priority for selection as potential COCs. Comparisons to standards were done individually for each media (see Tables 6-3 through 6-8). The degree to which a chemical concentration exceeded the standard or guidance value was also taken into consideration. For instance, if a chemical concentration exceeded the applicable standard by several orders of magnitude, the chemical was typically given more weight for consideration as a potential COC than a chemical that minimally exceeded its standard.

   In general, chemicals that are common earth minerals or essential nutrients were eliminated from further consideration as potential COCs where applicable. Parameters typically considered for exclusion were aluminum, calcium, iron, magnesium, potassium, and sodium.

2. The second criterion was an evaluation of the frequency of chemical detection; the higher the frequency of detection of a given parameter, the higher the priority given for consideration as a potential COC. If a chemical was detected in more than 5% of the samples collected in a given matrix, it was given further consideration in the COC selection process. Note that all samples within a given matrix were not necessarily analyzed for every parameter listed in Tables 6-3 through 6-8.

3. Inorganic chemicals retained by Steps 1 and 2 were evaluated in light of background concentrations. If the maximum chemical concentration was equal to or greater than two times the applicable background chemical concentration, the chemical was considered further as a potential COC. Two surface soil samples were considered to be background as they were located in off-site areas. These samples were used to evaluate background concentrations

TABLE 6-3
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

(Page 1 of 2)

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site

CAS Number	Chemical	(1) Minimum Concentration	Minimum Qualifier	(1) Maximum Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	(4) Background Value	(5) Screening Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	(6) Rationale for Contaminant Deletion or Selection
75-25-2	Bromoform	10	J	12	J	ug/kg	SS-15, -16	7/7	NA	12	N/A	720000 C	81000	EPA SSLs	NO	BSL
75-09-2	Methylene Chloride	1	J	1	J	ug/kg	SS-10, -14	2/7	11 - 12	1	N/A	760000 C	85000	EPA SSLs	NO	BSL
106-46-7	1,4-Dichlorobenzene	46	J	47	J	ug/kg	SS-33	2/27	330 -3700	47	N/A	240000 C	27000	EPA SSLs	NO	BSL
91-57-6	2-Methylnaphthalene	46	J	540		ug/kg	SS-27	11/27	330 -3700	540	N/A	41000000 N	36400	NYS TAGM	NO	BSL
106-47-8	4-Chloroaniline	75	J	210	J	ug/kg	SS-20	5/27	330 -3700	210	N/A	8200000 N	3500000	Reg IX PRG	NO	BSL
83-32-9	Acenaphthene	61	J	1000		ug/kg	SS-32	16/27	330 -3700	1000	N/A	120000000 N	4700000	EPA SSLs	NO	BSL
208-96-8	Acenaphthylene	43	J	1800	J	ug/kg	SS-11	17/27	330 - 1900	1800	N/A	N/A	41000	NYS TAGM	NO	NTX, BSL
120-12-7	Anthracene	50	J	2500	J	ug/kg	SS-11	22/27	330 - 1900	2500	N/A	610000000 N	23000000	EPA SSLs	NO	BSL
56-55-3	Benzo(a)anthracene	40	J	8800	D	ug/kg	SS-32	25/27	330 - 350	8800	N/A	78000 C	900	EPA SSLs	YES	FD, ASL
50-32-8	Benzo(a)pyrene	40	J	8700	D	ug/kg	SS-32	25/27	330 - 9500	8700	N/A	780 C	90	EPA SSLs	YES	FD, ASL
205-99-2	Benzo(b)fluoranthene	60	J	13900		ug/kg	SS-11	24/27	330 - 1900	13900	N/A	7800 C	900	EPA SSLs	YES	FD, ASL
191-24-2	Benzo(g,h,i)perylene	40	J	5200	D	ug/kg	SS-32	24/27	330 - 390	5200	N/A	N/A	50000	NYS TAGM	NO	NTX, BSL
207-08-9	Benzo(k)fluoranthene	70	J	3700	J	ug/kg	SS-11	25/27	330 - 370	3700	N/A	78000 C	9000	EPA SSLs	NO	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	40	J	1360		ug/kg	SS-16	5/27	330 - 1900	1360	N/A	410000 C	46000	EPA SSLs	NO	BSL
86-74-8	Carbazole	47	J	700		ug/kg	SS-11, -32	17/27	330 - 1900	700	N/A	290000 C	32000	EPA SSLs	NO	BSL
218-01-9	Chrysene	50	J	9100	D	ug/kg	SS-32	26/27	330 - 350	9100	N/A	780000 C	88000	EPA SSLs	NO	BSL
53-70-3	Dibenz(a,h)anthracene	99	J	960		ug/kg	SS-28	17/27	330 - 1900	960	N/A	780 C	90	EPA SSLs	YES	ASL
132-64-9	Dibenzofuran	47	J	3700	J	ug/kg	SS-11	51.85	330 - 3700	3700	N/A	8200000 N	5100000	Reg IX PRG	NO	BSL
206-44-0	Fluoranthene	41	J	18000		ug/kg	SS-11	27/27	NA	18000	N/A	82000000 N	3100000	EPA SSLs	NO	BSL
86-73-7	Fluorene	36	J	1100	J	ug/kg	SS-11	18/27	330 - 1900	1100	N/A	82000000 N	3100000	EPA SSLs	NO	BSL
118-74-1	Hexachlorobenzene	110	J	130	J	ug/kg	SS-20	2/27	330 - 3700	130	N/A	3600 C	400	EPA SSLs	NO	BSL, IFD
193-39-5	Indeno(1,2,3-cd)pyrene	70	J	5000	D	ug/kg	SS-32	23/27	330 - 1900	5000	N/A	7800 C	900	EPA SSLs	YES	FD, ASL
91-20-3	Naphthalene	50	J	670		ug/kg	SS-32	13/27	330 - 3700	670	N/A	41000000 N	3100000	EPA SSLs	NO	BSL
85-01-8	Phenanthrene	50	J	14000	D	ug/kg	SS-32	26/27	330 - 350	14000	N/A	N/A	50000	NYS TAGM	NO	NTX, BSL
129-00-0	Pyrene	44	J	16000	D	ug/kg	SS-32	27/27	NA	16000	N/A	61000000 N	2300000	EPA SSLs	NO	BSL
72-54-8	4,4' - DDD	6.9		27		ug/kg	SS-11	3/27	3.4 - 37	27	N/A	24000 C	3000	EPA SSLs	NO	BSL
72-55-9	4,4' - DDE	1.7	JP	15		ug/kg	SS-13	3/27	3.4 - 350	15	N/A	17000 C	2000	EPA SSLs	NO	BSL
50-29-3	4,4'-DDT	0.61	JP	20	P	ug/kg	SS-12	4/27	3.4 - 350	20	N/A	17000 C	2000	EPA SSLs	NO	BSL
309-00-2	Aldrin	1.4	J	1.8	JP	ug/kg	SS-11	2/27	1.8 - 180	1.8	N/A	340 C	40	EPA SSLs	NO	BSL, IFD
12789-03-6	alpha-Chlordane	4.4	JP	6.9	JP	ug/kg	SS-11	2/27	1.8 - 180	6.9	N/A	16000 C	500	EPA SSLs	NO	BSL, IFD

(1) Minimum/maximum detected concentration.

(2) Total of 7 surface soil samples analyzed for VOCs; 27 samples analyzed for SVOCs and Pest/PCBs; 29 samples analyzed for met

(3) Maximum concentration used for screening.

(4) Off-Site samples SS-40 and SS-41 used as background samples - Refer to text for supporting information.
Maximum analyte concentration found in two samples used as screening tool.

(5) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for industrial soil used.
(Cancer benchmark value = 1E-06; HQ=0.1)

(6) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient or common earth mineral(NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
EPA SSLs= EPA Generic Soil Screening Levels.
Reg IX PRG = EPA Region IX Preliminary Remediation Goals.
NYS TAGM = New York State Technical Administrative Guidance Manual (soil guidance values).
East U.S. = Eastern U.S. background range.
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

TABLE 6-3
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value (4)	Screening Toxicity Value (5)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (6)
319-85-7	BHC (beta isomer)	2.1	P	2.7	JP	ug/kg	SS-11	3/27	1.8 - 180	2.7	N/A	3200 C	400	EPA SSLs	NO	BSL
319-86-8	BHC (delta isomer)	0.31	JP	0.9	J	ug/kg	SS-11	2/27	1.8 - 180	0.9	N/A	N/A	300	NYS TAGM	NO	NTX, BSL, IFD
58-89-9	BHC (gamma isomer) (Linda	0.66	JP	0.71	JP	ug/kg	SS-11	2/27	1.8 - 180	0.71	N/A	4400 C	500	EPA SSLs	NO	BSL, IFD
60-57-1	Dieldrin	0.45	JP	6.8	JP	ug/kg	SS-11	4/27	3.5 -350	6.8	N/A	360 C	40	EPA SSLs	NO	BSL
7421-36-3	Endrin Aldehyde	0.62	JP	14	JP	ug/kg	SS-11	3/27	3.4 - 350	14	N/A	N/A	NA	NA	NO	NTX
53494-70-5	Endrin Ketone	3.5	JP	35	P	ug/kg	SS-11	3/27	3.4 - 350	35	N/A	N/A	NA	NA	NO	NTX
5103-74-2	gamma-Chlordane	0.72	J	7.9	P	ug/kg	SS-11	3/27	1.8 - 180	7.9	N/A	N/A	540	NYS TAGM	NO	NTX, BSL
72-43-5	Methoxychlor	2.7	JP	17	JP	ug/kg	SS-11	3/27	17.9 - 1800	17	N/A	10000000 N	390000	EPA SSLs	NO	BSL
1267-229-6	Aroclor-1248	220		8400	J	ug/kg	SS-16	2/27	34 - 3500	8400	N/A	2900 C	1000	EPA SSLs	YES	ASL
742-99-05	Aluminum	5160		13000		mg/kg	SS-39	29/29	NA	13000	11100	2000000 N	100000	Reg IX PRG	NO	BSL, BKG,NUT
7440-38-2	Arsenic	2.6		7		mg/kg	SS-11	9/29	2.1 - 2.2	7	BDL	3.8 C	0.4	EPA SSLs	YES	ASL
7440-39-3	Barium	32.1		530		mg/kg	SS-26	29/29	NA	530	64	140000 N	5500	EPA SSLs	NO	NUT, BSL
7440-41-7	Beryllium	0.36	B	0.48	B	mg/kg	SS-11	7/29	0.62 - 0.66	0.48	BDL	4100 N	1.75	East U.S.	NO	BSL,NUT
7440-43-9	Cadmium	1.1		17.3		mg/kg	SS-11	29/29	NA	17.3	1.4	2000 N	78	EPA SSLs	NO	BSL
7440-70-2	Calcium	6860	G	119000		mg/kg	SS-11	29/29	NA	119000	12800	N/A	12800 (SB)	NYS TAGM	NO	NUT
7440-47-3	Chromium	10.7		127.1	J	mg/kg	SS-16	29/29	NA	127.1	20	N/A	390	EPA SSLs	NO	BSL
7440-48-4	Cobalt	4.8	B	16.5		mg/kg	SS-15	29/29	NA	16.5	9	120000 N	100000	Reg IX PRG	NO	BKG, BSL
7440-50-8	Copper	18.3		859.6		mg/kg	SS-16	29/29	NA	859.6	23	82000 N	76000	Reg IX PRG	NO	BSL
7439-89-6	Iron	4800		19800		mg/kg	SS-28	29/29	NA	19800	16400	610000 N	100000	Reg IX PRG	NO	BKG, NUT, BSL
7439-92-1	Lead	8.7		1163.2		mg/kg	SS-15	29/29	NA	1163.2	20	N/A	400	EPA SSLs	YES	ASL,TX
7439-95-4	Magnesium	1746		27000		mg/kg	SS-22	29/29	NA	27000	7410	N/A	7410 (SB)	NYS TAGM	NO	NUT, NTX
7439-96-5	Manganese	273		4447	J	mg/kg	SS-15	29/29	NA	4447	509	290000 N	32000	Reg IX PRG	NO	BKG, BSL
7439-97-6	Mercury	0.22		2.6		mg/kg	SS-11	18/29	0.1 - 0.11	2.6	BDL	N/A	23	EPA SSLs	NO	BSL
7440-02-0	Nickel	10.9		82.3		mg/kg	SS-16	29/29	NA	82.3	16	41000 N	1600	EPA SSLs	NO	BSL
7440-09-7	Potassium	557	B	2872	J	mg/kg	SS-15	29/29	NA	2872	982	N/A	982 (SB)	NYS TAGM	NO	NUT
7782-49-2	Selenium	4.6	N	22.8	N	mg/kg	SS-22	22/29	1.0 - 1.2	22.8	9	10000 N	390	EPA SSLs	NO	BSL
7440-22-4	Silver	0.35		8		mg/kg	SS-21, -21, -28	14/29	0.33 - 2.2	8	BDL	10000 N	390	EPA SSLs	NO	BSL
7440-23-5	Sodium	663	B	875	B	mg/kg	SS-15	7/29	208 - 221	875	BDL	N/A	SB	NYS TAGM	NO	NUT
7440-28-0	Thallium	2.4	N	3.6	N	mg/kg	SS-29, -32	10/29	1.2 - 2.2	3.6	BDL	140 N	130	Reg IX PRG	NO	BSL
7440-62-2	Vanadium	11.9		22.4		mg/kg	SS-28	27/29	6.3 - 6.5	22.4	22	14000 N	550	EPA SSLs	NO	BKG, BSL
7440-66-6	Zinc	39.4	E	1732.6		mg/kg	SS-16	29/29	NA	1732.6	62	610000 N	23000	EPA SSLs	NO	BSL

(1) Minimum/maximum detected concentration.
(2) Total of 7 surface soil samples analyzed for VOCs; 27 samples analyzed for SVOCs and Pest/PCBs; 29 samples analyzed for met
(3) Maximum concentration used for screening.
(4) Off-Site samples SS-40 and SS-41 used as background samples - Refer to text for supporting information.
Maximum analyte concentration found in two samples used as screening tool.
(5) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Industrial soil used.
(Cancer benchmark value = 1E-06; HQ=0.1)
(6) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient or common earth mineral(NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
EPA SSLs= EPA Generic Soil Screening Levels.
Reg IX PRG = EPA Region IX Preliminary Remediation Goals.
NYS TAGM = New York State Technical Administrative Guidance Manual (soil guidance values).
East U.S. = Eastern U.S. background range.
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

TABLE 6-4
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value (4)	Screening Toxicity Value (5)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (6)
71-55-6	1,1,1-Trichloroethane	58.62	J	58.62	J	ug/kg	TP-34	1/8	11 - 30	58.62	N/A	570000000 N	1400000	Reg IX PRG	NO	BSL, IFD
75-34-3	1,1-Dichloroethane	377.34	EJ	377.34	EJ	ug/kg	TP-34	1/8	11 - 30	377.34	N/A	200000000 N	7800000	EPA SSLs	NO	BSL, IFD
75-35-4	1,1-Dichloroethene	4.92	J	4.92	J	ug/kg	TP-34	1/8	11 - 30	4.92	N/A	9500 C	1000	EPA SSLs	NO	BSL, IFD
540-59-0	1,2-Dichloroethene (total)	766.31	EJ	766.31	EJ	ug/kg	TP-34	1/5	11 - 30	766.31	N/A	18000000 N	780000	EPA SSLs	NO	BSL, IFD
78-93-3	2-Butanone	4.82	J	420.00	E	ug/kg	TP-45	7/8	14	420.00	N/A	1200000000 N	28000000	Reg IX PRG	NO	BSL
67-64-1	Acetone	25.88		1600.00	EG	ug/kg	TP-45	8/8	NA	1600.00	N/A	200000000 N	7800000	EPA SSLs	NO	BSL
71-43-2	Benzene	2.20	J	26.90	J	ug/kg	TP-34	6/8	12 - 20	26.90	N/A	100000 C	22000	EPA SSLs	NO	BSL
75-15-0	Carbon Disulfide	10.00	J	130.00	G	ug/kg	TP-45	4/8	11 - 30	130.00	N/A	200000000 N	7800000	EPA SSLs	NO	BSL
108-90-7	Chlorobenzene	9.62	J	23.00	G	ug/kg	TP-45	4/8	11 - 20	23.00	N/A	41000000 N	1600000	EPA SSLs	NO	BSL
75-00-3	Chloroethane	283.28	EJ	283.28	EJ	ug/kg	TP-34	1/8	11 - 30	283.28	N/A	2000000 C	6500	Reg IX PRG	NO	BSL, IFD
67-66-3	Chloroform	6.00	J	11.00	J	ug/kg	TP-47	3/8	11 - 30	11.00	N/A	940000 C	100000	EPA SSLs	NO	BSL
100-41-4	Ethylbenzene	8.00	J	9700.00	G	ug/kg	TP-47	4/8	12 - 30	9700.00	N/A	200000000 N	7800000	EPA SSLs	NO	BSL
75-09-2	Methylene Chloride	1.59	J	15.24	J	ug/kg	TP-34	4/8	11 - 71	15.24	N/A	760000 C	85000	EPA SSLs	NO	BSL
100-42-5	Styrene	25.00	G	25.00	G	ug/kg	TP-47	1/8	11 - 30	25.00	N/A	410000000 N	16000000	EPA SSLs	NO	BSL, IFD
127-18-4	Tetrachloroethene	6.45	J	6.45	J	ug/kg	TP-34	1/8	11 - 30	6.45	N/A	110000 C	12000	EPA SSLs	NO	BSL, IFD
108-88-3	Toluene	1.44	J	147949.02	BDJ	ug/kg	TP-34	5/8	12 - 30	147949.02	N/A	410000000 N	16000000	EPA SSLs	NO	BSL
79-01-6	Trichloroethene	2.71	J	2.71	J	ug/kg	TP-34	1/8	11 - 30	2.71	N/A	520000 C	58000	EPA SSLs	NO	BSL, IFD
75-01-4	Vinyl Chloride	126.80	J	126.80	J	ug/kg	TP-34	1/8	11 - 30	126.80	N/A	3800 C	300	EPA SSLs	NO	BSL, IFD
133-02-7	Xylene (total)	0.74	G	45361.58	D	ug/kg	TP-34	4/8	11 - 30	45361.58	N/A	4100000000 N	160000000	EPA SSLs	NO	BSL
95-50-1	1,2-Dichlorobenzene	4400	J	4400	J	ug/kg	TP-34	1/8	530-8600	4400	N/A	180000000 N	7000000	EPA SSLs	NO	BSL, IFD
105-67-9	2,4-Dimethylphenol	92	J	350	J	ug/kg	TP-14	2/8	540-8600	350	N/A	41000000 N	1600000	EPA SSLs	NO	BSL
91-57-6	2-Methylnaphthalene	120	J	950	J	ug/kg	TP-14	2/8	540-8600	950	N/A	41000000 N	36400	NYS TAGM	NO	NTX, BSL
95-48-7	2-Methylphenol	250	J	250	J	ug/kg	TP-14	1/8	530-8600	250	N/A	N/A	44000000	Reg IX PRG	NO	NTX,BSL,IFD
106-44-5	4-Methylphenol	160	J	1500	J	ug/kg	TP-34	2/8	540-8600	1500	N/A	N/A	4400000	Reg IX PRG	NO	NTX,BSL,IFD

Minimum/maximum detected concentration.
(2) Total of 8 subsurface soil samples analyzed for VOCs, SVOCs, and Pest/PCBs; 12 samples analyzed for metals.
(3) Maximum concentration used for screening.
(4) Off-Site surface soil samples SS-40 and SS-41 used as background samples - Refer to text for supporting information. Maximum analyte concentration found in two samples used as screening tool.
(5) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Industrial soil used. (Cancer benchmark value = 1E-06; HQ=0.1)
(6) Rationale Codes

Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)

Deletion Reason:
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient or common earth mineral(NUT)
- Below Screening Level (BSL)

Definitions:
- N/A = Not Applicable
- SQL = Sample Quantitation Limit
- COPC = Chemical of Potential Concern
- ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
- EPA SSLs= EPA Generic Soil Screening Levels.
- Reg IX PRG = EPA Region IX Preliminary Remediation Goals.
- NYS TAGM = New York State Technical Administrative Guidance Manual (soil guidance values).
- East U.S.= Eastern U.S. background range
- J = Estimated Value
- C = Carcinogenic
- N = Non-Carcinogenic
- BDL = below detection limits

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TABLE 6-4
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value (4)	Screening Toxicity Value (5)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (6)
83-32-9	Acenaphthene	350	J	3300	J	ug/kg	TP-8	3/8	530-4800	3300	N/A	120000000 N	4700000	EPA SSLs	NO	BSL
208-96-8	Acenaphthylene	170	J	2200	J	ug/kg	TP-8	2/8	530-4800	2200	N/A	N/A	41000	NYS TAGM	NO	NTX,BSL
120-12-7	Anthracene	710		8400		ug/kg	TP-8	4/8	530-4800	8400	N/A	610000000 N	23000000	EPA SSLs	NO	BSL
56-55-3	Benzo(a)anthracene	1050	J	16000		ug/kg	TP-8	6/8	530-1900	16000	N/A	78000 C	900	EPA SSLs	YES	ASL
50-32-8	Benzo(a)pyrene	400	J	11700		ug/kg	TP-8	7/8	530	11700	N/A	780 C	90	EPA SSLs	YES	ASL
205-99-2	Benzo(b)fluoranthene	750	J	22200		ug/kg	TP-8	7/8	530	22200	N/A	7800 C	900	EPA SSLs	YES	ASL
191-24-2	Benzo(g,h,i)perylene	500	J	4400	J	ug/kg	TP-8	6/8	530-1900	4400	N/A	N/A	50000	NYS TAGM	NO	NTX, BSL
207-08-9	Benzo(k)fluoranthene	400	J	1000	J	ug/kg	TP-34	5/8	530 - 8600	1000	N/A	78000 C	9000	EPA SSLs	NO	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	550	J	19000		ug/kg	TP-8	7/8	2050	19000	N/A	410000 C	46000	EPA SSLs	NO	BSL
218-01-9	Chrysene	800	J	15400		ug/kg	TP-8	7/8	530	15400	N/A	780000 C	88000	EPA SSLs	NO	BSL
53-70-3	Dibenz(a,h)anthracene	1500	J	1500	J	ug/kg	TP-8	1/8	530-4800	1500	N/A	780 C	90	EPA SSLs	YES	ASL
132-64-9	Dibenzofuran	220	J	3100	J	ug/kg	TP-8	2/8	530-4800	3100	N/A	8200000 N	5100000	Reg IX PRG	NO	BSL
84-74-2	Di-n-Butylphthalate	1000	J	1000	J	ug/kg	TP-34	1/8	530-8600	1000	N/A	N/A	7800000	EPA SSLs	NO	BSL,IFD
206-44-0	Fluoranthene	280	J	43400		ug/kg	TP-8	7/8	1900	43400	N/A	82000000 N	3100000	EPA SSLs	NO	BSL
86-73-7	Fluorene	300	J	8300	J	ug/kg	TP-8	6/8	530 - 2050	8300	N/A	82000000 N	3100000	EPA SSLs	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	600	J	5200	J	ug/kg	TP-8	6/8	530-1900	5200	N/A	7800 C	900	EPA SSLs	YES	ASL
78-59-1	Isophorone	350	J	1850	J	ug/kg	TP-14	2/8	540-8600	1850	N/A	6000000 C	670000	EPA SSLs	NO	BSL
91-20-3	Naphthalene	120	J	1300	J	ug/kg	TP-34	4/8	540-8600	1300	N/A	41000000 N	3100000	EPA SSLs	NO	BSL
85-01-8	Phenanthrene	420	J	37200		ug/kg	TP-8	8/8	NA	37200	N/A	N/A	50000	NYS TAGM	NO	NTX,BSL
108-95-2	Phenol	500	J	500	J	ug/kg	TP-14	1/8	530-8600	500	N/A	1200000000 N	47000000	EPA SSLs	NO	BSL,IFD
129-00-0	Pyrene	340	J	39300		ug/kg	TP-8	8/8	NA	39300	N/A	61000000 N	2300000	EPA SSLs	NO	BSL
1267-229-6	Aroclor-1248	87	P	420000	PDJ	ug/kg	TP-8	7/8	520	420000	N/A	2900 C	1000	EPA SSLs	YES	ASL

Minimum/maximum detected concentration.
(2) Total of 8 subsurface soil samples analyzed for VOCs, SVOCs, and Pest/PCBs; 12 samples analyzed for metals.
(3) Maximum concentration used for screening.
(4) Off-Site surface soil samples SS-40 and SS-41 used as background samples - Refer to text for supporting information. Maximum analyte concentration found in two samples used as screening tool.
(5) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Industrial soil used. (Cancer benchmark value = 1E-06; HQ=0.1)
(6) Rationale Codes
Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient or common earth mineral(NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
EPA SSLs= EPA Generic Soil Screening Levels.
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East U.S.= Eastern U.S. background range
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

TABLE 6-4
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

(Page 3 of 3)

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value (4)	Screening Toxicity Value (5)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (6)
742-99-05	Aluminum	1600.00		20587.18		mg/kg	TP-8	12/12	NA	20587.18	11100	2000000 N	100000	Reg IX PRG	NO	BSL,BKG,NUT
7440-36-0	Antimony	1.85	BNJ	22.00	N	mg/kg	TP-46	6/12	1.4 - 4.8	22.00	BDL	820000 N	31000	EPA SSLs	NO	BSL
7440-38-2	Arsenic	2.20	N	20.80	N	mg/kg	TP-47	8/12	2.2 - 3.3	20.80	BDL	3.8 C	0.4	EPA SSLs	YES	ASL
7440-39-3	Barium	23.60	B	250.79	EJ	mg/kg	TP-8	12/12	NA	250.79	64	140000 N	5500	EPA SSLs	NO	BSL
7440-41-7	Beryllium	0.37	BNJ	1.35	BNJ	mg/kg	TP-8	5/12	0.65 - 1.1	1.35	BDL	4100 N	1.75	East U.S.	NO	BSL,NUT
7440-43-9	Cadmium	6.00		34.48	N*J	mg/kg	TP-14	8/12	1.1 - 1.1	34.48	1.4	2000 N	78	EPA SSLs	NO	BSL
7440-70-2	Calcium	22654.54		571000.00	G	mg/kg	B-23 (18-20)	12/12	NA	571000.00	12800	N/A	12800 (SB)	NYS TAGM	NO	NUT
7440-47-3	Chromium	3.20		4265.03		mg/kg	TP-8	12/12	NA	4265.03	20	N/A	390	EPA SSLs	YES	ASL,FD
7440-48-4	Cobalt	4.40	B	16.15	BNJ	mg/kg	TP-8	8/12	4.4 - 6.3	16.15	9	120000 N	100000	Reg IX PRG	NO	BSL,BKG
7440-50-8	Copper	10.60		3272.97		mg/kg	TP-8	12/12	NA	3272.97	23	82000 N	76000	Reg IX PRG	NO	BSL
7439-89-6	Iron	4900.00		54496.93	*J	mg/kg	TP-14	12/12	NA	54496.93	16400	610000 N	100000	Reg IX PRG	NO	BSL,NUT
7439-92-1	Lead	2.20		417.91	NJ	mg/kg	TP-8	12/12	NA	417.91	20	N/A	400	EPA SSLs	YES	ASL,FD,TX
7439-95-4	Magnesium	1644.95		23336.41		mg/kg	TP-8	12/12	NA	23336.41	7410	N/A	7410 (SB)	NYS TAGM	NO	NUT
7439-96-5	Manganese	161.78	N*J	1921.91	N*J	mg/kg	TP-14	12/12	NA	1921.91	509	290000 N	32000	Reg IX PRG	NO	BSL
7439-97-6	Mercury	0.15		0.87		mg/kg	TP-46	4/12	0.11 - 6.7	0.87	BDL	N/A	23	EPA SSLs	NO	BSL
7440-02-0	Nickel	7.40	B	1400.00		mg/kg	TP-46	10/12	6.7 - 6.7	1400.00	16	41000 N	1600	EPA SSLs	NO	BSL
7440-09-7	Potassium	386.00	B	2721.59		mg/kg	TP-8	12/12	NA	2721.59	982	N/A	982 (SB)	NYS TAGM	NO	NUT
7782-49-2	Selenium	8.10	N	18.50	N	mg/kg	B-23 (18-20)	7/12	1.1 - 2.6	18.50	9	10000 N	390	EPA SSLs	NO	BSL
7440-22-4	Silver	5.07	BNJ	10.10		mg/kg	TP-45	3/12	0.4 - 3.2	10.10	BDL	10000 N	390	EPA SSLs	NO	BSL
7440-23-5	Sodium	950.32	BJ	1972.36	B	mg/kg	TP-8	5/12	216 - 359	1972.36	BDL	N/A	SB	NYS TAGM	NO	NUT
7440-28-0	Thallium	1.65	BNJ	4.00		mg/kg		7/12	1 - 3	4.00	BDL	140 N	130	Reg IX PRG	NO	BSL
7440-62-2	Vanadium	8.20	B	46.31	EJ	mg/kg	TP-8	8/12	6.7 - 10.8	46.31	22	14000 N	550	EPA SSLs	NO	BSL
7440-66-6	Zinc	13.00	E	1324.62		mg/kg	TP-8	12/12	NA	1324.62	62	610000 N	23000	EPA SSLs	NO	BSL

Minimum/maximum detected concentration.

(2) Total of 8 subsurface soil samples analyzed for VOCs, SVOCs, and Pest/PCBs; 12 samples analyzed for metals.

(3) Maximum concentration used for screening.

(4) Off-Site surface soil samples SS-40 and SS-41 used as background samples - Refer to text for supporting information. Maximum analyte concentration found in two samples used as screening tool.

(5) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Industrial soil used. (Cancer benchmark value = 1E-06; HQ=0.1)

(6) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient or common earth mineral(NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
EPA SSLs= EPA Generic Soil Screening Levels.
Reg IX PRG = EPA Region IX Preliminary Remediation Goals.
NYS TAGM = New York State Technical Administrative Guidance Manual (soil guidance values).
East U.S.= Eastern U.S. background range
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

TABLE 6-5
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value	Screening Toxicity Value (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (5)
71-55-6	1,1,1-Trichloroethane	4.45	J	2800.00	DJ	ug/l	MW-10	3/17	10 - 20	2800.00	N/A	3200 N	200	MCL	YES	ASL
75-34-3	1,1-Dichloroethane	2.54	J	570.00	EJ	ug/l	MW-10	2/17	10 - 20	570.00	N/A	800 N	810	Reg IX PRG	NO	BSL, IFD
75-35-4	1,1-Dichloroethene	360.00	EG	360.00	EG	ug/l	MW-10	1/17	10 - 20	360.00	N/A	0.044 C	7	MCL	YES	ASL
540-59-0	1,2-Dichloroethene (total)	11.63		38011.00	DG	ug/l	MW-10	4/17	10 - 20	38011.00	N/A	55 N	NA	NA	YES	ASL
67-64-1	Acetone	40.00		40.00		ug/l	MW-0	1/17	10 - 20	40.00	N/A	610 N	50	NYS TOGS	NO	BSL,IFD
71-43-2	Benzene	2.69	J	29.00	G	ug/l	MW-10	3/17	10 -20	29.00	N/A	0.32 C	5	MCL	YES	ASL
108-90-7	Chlorobenzene	1.00	J	23.00		ug/l	MW-8	5/17	10 - 20	23.00	N/A	110 N	110	Reg IX PRG	NO	BSL
75-00-3	Chloroethane	9.44	J	94.22		ug/l	MW-3	3/17	10 - 20	94.22	N/A	3.6 C	4.6	Reg IX PRG	YES	ASL
74-87-3	Chloromethane	6.71	J	47.00	G	ug/l	MW-10	2/17	10 - 20	47.00	N/A	2.1 C	1.5	Reg IX PRG	YES	ASL
100-41-4	Ethylbenzene	3100.00	DJ	3100.00	DJ	ug/l	MW-10	1/17	10 - 20	3100.00	N/A	1300 N	700	MCL	NO	IFD
127-18-4	Tetrachloroethene	6.00	G	6.00	G	ug/l	MW-10	1/17	10 - 20	6.00	N/A	1.1 C	5	MCL	NO	IFD
108-88-3	Toluene	3.00	BJ	61000.00	DG	ug/l	MW-10	10/17	10 -20	61000.00	N/A	750 N	1000	MCL	YES	ASL
542-75-6	trans-1,3-Dichloropropene	124.81		124.81		ug/l	MW-15	1/17	10 - 20	124.81	N/A	NA	NA	NA	NO	IFD,NTX
79-01-6	Trichloroethene	1.68	J	570.00	EG	ug/l	MW-10	3/17	10 - 20	570.00	N/A	1.6 C	5	MCL	YES	ASL
75-01-4	Vinyl Chloride	106.66		740.00	EG	ug/l	MW-10	2/17	10 - 20	740.00	N/A	0.04 C	2	MCL	YES	ASL
133-02-7	Xylene (total)	1.43	J	17900.00	DJ	ug/l	MW-10	5/17	10 - 20	17900.00	N/A	12000 N	10000	MCL	YES	ASL
95-50-1	1,2-Dichlorobenzene	3.52	J	5.00	J	ug/l	MW-10	2/17	9 - 10	5.00	N/A	550 N	600	MCL	NO	BSL,IFD
106-46-7	1,4-Dichlorobenzene	2.35	J	9.00	J	ug/l	MW-10	4/17	9 - 10	9.00	N/A	0.47 C	75	MCL	YES	ASL
105-67-9	2,4-Dimethylphenol	20.00	G	20.00	G	ug/l	MW-10	1/17	9 - 10	20.00	N/A	730 N	730	Reg IX PRG	NO	BSL, IFD
91-58-7	2-Chloronaphthalene	1.97	J	1.97	J	ug/l	MW-3	1/17	9 - 10	1.97	N/A	N/A	10	NYS TOGS	NO	BSL,IFD,NTX

(1) Minimum/maximum detected concentration.
(2) Total of 17 groundwater samples used in COC screening. Only total metals concentrations used for groundwater evaluation.
(3) Maximum concentration used for screening.

(4) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Tap Water used.
(Cancer benchmark value = 1E-06; HQ=0.1)

(5) Rationale Codes
Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)

Deletion Reason:
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
Reg IX PRG = EPA Region IX Preliminary Remediation Goals
NYS TOGS = New York State Technical and Operational Guidance Series for groundwater criteria.
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

TABLE 6-5
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value	Screening Toxicity Value (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (5)
91-57-6	2-Methylnaphthalene	1.68	J	9.00	J	ug/l	MW-10	3/17	9 - 10	9.00	N/A	120 N	N/A	N/A	NO	BSL
95-48-7	2-Methylphenol	78.00	G	78.00	G	ug/l	MW-10	1/17	9 - 10	78.00	N/A	1800 N	1800	Reg IX PRG	NO	BSL,IFD
106-44-5	4-Methylphenol	2.24	J	130.00	D	ug/l	MW-10	2/17	9 - 10	130.00	N/A	180 N	180	Reg IX PRG	NO	BSL,IFD
117-81-7	Bis(2-Ethylhexyl)phthalate	1.44	J	17.00		ug/l	MW-9	4/17	9 - 10	17.00	N/A	4.8 C	4.8	Reg IX PRG	NO	IFD
85-68-7	Butylbenzylphthalate	1.00	J	5.17	J	ug/l	MW-9	5/17	9 - 10	5.17	N/A	7300 N	7300	Reg IX PRG	NO	BSL
84-66-2	Diethylphthalate	1.02	J	16.00	G	ug/l	MW-10	3/17	9 - 10	16.00	N/A	29000 N	29000	Reg IX PRG	NO	BSL
84-74-2	Di-n-Butylphthalate	2.00	J	10.00	G	ug/l	MW-10	2/17	9 - 10	10.00	N/A	N/A	NA	NA	NO	NTX,IFD
86-73-7	Fluorene	1.04	J	1.04	J	ug/l	MW-15	1/17	9 - 10	1.04	N/A	240 N	240	Reg IX PRG	NO	BSL, IFD
91-20-3	Naphthalene	1.14	J	36.00	G	ug/l	MW-10	4/17	9 - 10	36.00	N/A	6.5 N	6.2	Reg IX PRG	YES	ASL
85-01-8	Phenanthrene	1.25	J	1.25	J	ug/l	MW-15	1/17	9 - 10	1.25	N/A	N/A	50	NYS TOGS	NO	NTX,IFD,BSL
50-29-3	4,4'-DDT	0.015	JP	0.015	JP	ug/l	MW-3	1/17	0.095 - 0.47	0.015	N/A	0.2 C	0.2	Reg IX PRG	NO	BSL, IFD
30-90-2	Aldrin	0.0098	JP	0.0098	JP	ug/l	MW-12	1/17	0.047 - 0.05	0.0098	N/A	0.0039 C	0.004	Reg IX PRG	YES	ASL
31-98-36	BHC-alpha	0.0033	JP	0.0033	JP	ug/l	MW-12	1/17	0.047 - 0.05	0.0033	N/A	0.011 C	0.011	Reg IX PRG	NO	BSL,IFD
72-20-8	Endrin	0.0025	J	0.0025	J	ug/l	MW-7	1/17	0.094 - 0.10	0.0025	N/A	11 N	2	MCL	NO	BSL,IFD
76-44-8	Heptachlor	0.0016	JP	0.0016	JP	ug/l	MW-7	1/17	0.047 - 0.05	0.0016	N/A	0.015 C	0.4	MCL	NO	BSL,IFD
72-43-5	Methoxychlor	0.012	JP	0.055	JP	ug/l	MW-8	5/17	0.47 - 0.50	0.055	N/A	180 N	40	MCL	NO	BSL
12672-29-6	Aroclor-1248	0.18	JP	1.6		ug/l	MW-8	6/17	0.05 - 0.95	1.6	N/A	0.033 C	0.5	MCL	YES	ASL
7429-90-5	Aluminum	66.98	B	32444.00		ug/l	MW-6	17/17	NA	32444.00	N/A	37000 N	50	SMCL	NO	BSL, NUT
7440-36-0	Antimony	9.00	B	9.00	B	ug/l	MW-8	1/17	5.6 - 15	9.00	N/A	15 N	6	MCL	NO	IFD
7440-38-2	Arsenic	5.02	B	73.57		ug/l	MW-6	9/17	3.6 - 10	73.57	N/A	0.045 C	50	MCL	YES	ASL

(1) Minimum/maximum detected concentration.
(2) Total of 17 groundwater samples used in COC screening. Only total metals concentrations used for groundwater evaluation.
(3) Maximum concentration used for screening.

(4) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Tap Water used.
(Cancer benchmark value = 1E-06; HQ=0.1)

(5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
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Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

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TABLE 6-5
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value	Screening Toxicity Value (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (5)
7440-39-3	Barium	29.43	EJ	849.28		ug/l	MW-3	17/17	NA	849.28	N/A	2600 N	2000	MCL	NO	BSL
7440-41-7	Beryllium	1.72	B	1.72	B	ug/l	MW-6	1/17	1 - 3	1.72	N/A	73 N	4	MCL	NO	BSL,IFD
7440-43-9	Cadmium	1.41	B	34.00		ug/l	MW-1	14/17	0.5 - 5	34.00	N/A	18 N	5	MCL	YES	ASL
7440-70-2	Calcium	122060.00	NJ	341100.00	NJ	ug/l	MW-5	17/17	NA	341100.00	N/A	N/A	NA	NA	NO	NUT,NTX
7440-47-3	Chromium	2.77	B	309.00		ug/l	MW-10	13/17	1.8 - 1.8	309.00	N/A	N/A	100	MCL	YES	ASL
7440-48-4	Cobalt	1.47	B	50.70		ug/l	MW-10	15/17	1.3 - 1.3	50.70	N/A	2200 N	2200	Reg IX PRG	NO	BSL
7440-50-8	Copper	2.05	B	70.70		ug/l	MW-10	14/17	1.6 - 1.6	70.70	N/A	1500 N	1300	MCL	NO	BSL
7439-89-6	Iron	700.52		56000.00		ug/l	MW-6	17/17	NA	56000.00	N/A	11000 N	300	SMCL	NO	NUT
7439-92-1	Lead	2.00	J	52.16		ug/l	MW-15	14/17	2 - 2	52.16	N/A	N/A	15	MCL	YES	FD,ASL,TX
7439-95-4	Magnesium	28738.00		117800.00		ug/l	MW-5	17/17	NA	117800.00	N/A	N/A	35000	NYS TOGS	NO	NUT,NTX
7439-96-5	Manganese	33.36		3710.00		ug/l	MW-10	17/17	NA	3710.00	N/A	730 N	50	SMCL	YES	ASL,FD
7440-02-0	Nickel	6.75	B	269.00		ug/l	MW-10	14/17	1.9 - 1.9	269.00	N/A	730 N	1000	MCL	NO	BSL
7440-09-7	Potassium	2880.50	B	141530.00		ug/l	MW-3	5/5	NA	141530.00	N/A	N/A	NA	NA	NO	NUT
7440-22-4	Silver	4.11	B	4.11	B	ug/l	MW-8	1/17	1.6 - 10	4.11	N/A	180 N	180	Reg IX PRG	NO	BSL,IFD
7440-23-5	Sodium	22600.00		1256700.00	EJ	ug/l	MW-5D	17/17	NA	1256700.00	N/A	N/A	20000	NYS TOGS	NO	NUT
7440-28-0	Thallium	5.80	J	5.80	J	ug/l	MW-3, -12, -12D	3/17	5.8 - 10	5.80	N/A	2.6 N	2	MCL	NO	IFD
7440-62-2	Vanadium	1.96	B	51.28		ug/l	MW-6	13/17	1.3 - 1.3	51.28	N/A	260 N	260	Reg IX PRG	NO	BSL
7440-66-6	Zinc	6.07	*	255.00		ug/l	MW-10	5/5	NA	255.00	N/A	11000 N	11000	Reg IX PRG	NO	BSL
57-12-5	Cyanide	14.80		16.40		ug/l	MW-15	2/17	10 - 10	16.40	N/A	N/A	200	MCL	NO	BSL

(1) Minimum/maximum detected concentration.

(2) Total of 17 groundwater samples used in COC screening. Only total metals concentrations used for groundwater evaluation.

(3) Maximum concentration used for screening.

(4) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Tap Water used.
(Cancer benchmark value = 1E-06; HQ=0.1)

(5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
Reg IX PRG = EPA Region IX Preliminary Remediation Goals
NYS TOGS = New York State Technical and Operational Guidance Series for groundwater criteria
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

TABLE 6-6
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value (4)	Screening Toxicity Value (5)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (6)
67-64-1	Acetone	24.05		137.57		ug/kg	SED-24	9/10	16 - 16	137.57	N/A	200000000 N	7800000	EPA SSLs	NO	BSL
75-09-2	Methylene Chloride	3.33	J	6.77	J	ug/kg	SED-25	3/10	14 - 47	6.77	N/A	760000 C	85000	EPA SSLs	NO	BSL
133-02-7	Xylene (total)	4.74	J	4.74	J	ug/kg	SED-22	1/10	14 - 49	4.74	N/A	4100000000 N	160000000	EPA SSLs	NO	BSL,IFD
51-28-5	2,4-Dinitrophenol	2000	J	2000	J	ug/kg	SED-22D	1/10	1300 - 135500	2000	N/A	4100000 N	160000	EPA SSLs	NO	BSL,IFD
121-14-2	2,4-Dinitrotoluene	2000	J	2000	J	ug/kg	SED-22D	1/10	520 - 54000	2000	N/A	4100000 N	900	EPA SSLs	NO	IFD
83-32-9	Acenaphthene	300	J	2900		ug/kg	SED-22	3/10	520 - 54000	2900	N/A	120000000 N	4700000	EPA SSLs	NO	BSL
208-96-8	Acenaphthylene	400	J	1050	J	ug/kg	SED-22	5/10	520 - 54000	1050	N/A	N/A	41000	NYS TAGM	NO	NTX,BSL
120-12-7	Anthracene	310	J	2550		ug/kg	SED-22	8/10	510 - 1840	2550	N/A	610000000 N	23000000	EPA SSLs	NO	BSL
56-55-3	Benzo(a)anthracene	1230	J	9100		ug/kg	SED-22	8/10	520 - 1870	9100	N/A	78000 C	900	EPA SSLs	YES	ASL
50-32-8	Benzo(a)pyrene	1090	J	7450		ug/kg	SED-22	8/10	520 - 1870	7450	N/A	780 C	90	EPA SSLs	YES	ASL
205-99-2	Benzo(b)fluoranthene	1560		11700		ug/kg	SED-22	8/10	520 - 1870	11700	N/A	7800 C	900	EPA SSLs	YES	ASL
191-24-2	Benzo(g,h,i)perylene	270	J	2000	J	ug/kg	SED-22	7/10	520 - 2650	2000	N/A	N/A	50000	NYS TAGM	NO	NTX,BSL
207-08-9	Benzo(k)fluoranthene	470	J	2700	J	ug/kg	SED-22D	7/10	520 - 2650	2700	N/A	78000 C	9000	EPA SSLs	NO	BSL
117-81-7	Bis(2-Ethylhexyl)phtha	110	J	8000	J	ug/kg	SED-24	9/10	1870 - 1870	8000	N/A	410000 C	46000	EPA SSLs	NO	BSL
86-74-8	Carbazole	400	J	900	J	ug/kg	SED-22	3/10	520 - 54000	900	N/A	290000 C	32000	EPA SSLs	NO	BSL
218-01-9	Chrysene	1250	J	10150		ug/kg	SED-22	8/10	520 - 1870	10150	N/A	780000 C	88000	EPA SSLs	NO	BSL
53-70-3	Dibenz(a,h)anthracene	500	J	900	J	ug/kg	SED-22	4/10	520 - 54000	900	N/A	780 C	90	EPA SSLs	YES	ASL
132-64-9	Dibenzofuran	600	J	600	J	ug/kg	SED-22	1/10	520 - 54000	600	N/A	8200000 N	5100000	Reg IX PRG	NO	BSL,IFD
84-74-2	Di-n-Butylphthalate	70	J	1800	J	ug/kg	SED-22D	2/10	1560 - 54000	1800	N/A	N/A	7800000	EPA SSLs	NO	BSL
206-44-0	Fluoranthene	2940		19150		ug/kg	SED-22	8/10	520 - 1870	19150	N/A	82000000 N	3100000	EPA SSLs	NO	BSL
86-73-7	Fluorene	600	J	4,100		ug/kg	SED-22	6/10	510 - 3300	4,100	N/A	82000000 N	3100000	EPA SSLs	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	400	J	3200		ug/kg	SED-22	7/10	520 - 2650	3200	N/A	7800 C	900	EPA SSLs	YES	ASL
85-01-8	Phenanthrene	1010	J	9500		ug/kg	SED-22	8/10	520 - 1870	9500	N/A	N/A	50000	NYS TAGM	NO	NTX,BSL
129-00-0	Pyrene	1920		23700	EJ	ug/kg	SED-21	8/10	520 - 1870	23700	N/A	61000000 N	2300000	EPA SSLs	NO	BSL
12672-29-6	Aroclor-1248	2100	PJ	81000	PJ	ug/kg	SED-22D	8/10	50 - 180	81000	N/A	2900 C	1000	EPA SSLs	YES	ASL
11096-82-5	Aroclor-1260	280	JPX	4800	J	ug/kg	SED-21D	8/10	50 - 180	4800	N/A	2900 C	1000	EPA SSLs	YES	ASL

(1) Minimum/maximum detected concentration.

(2) Total of 10 sediment samples (from Ley Creek and on-site drainageways) used in COC screen. Refer to text for further discussion.

(3) Maximum concentration used for screening.

(4) Off-Site sample SED-20 used as background sample - Refer to text for supporting information.

(5) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Industrial soil used.
(Cancer benchmark value = 1E-06; HQ=0.1)

(6) Rationale Codes
Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient or common earth mineral (NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
EPA SSLs= EPA Generic Soil Screening Levels.
Reg IX PRG = EPA Region IX Preliminary Remediation Goals.
NYS TAGM = New York State Technical Administrative Guidance Manual (soil guidance values).
East U.S.= Eastern U.S. background range.
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

TABLE 6-6
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value (4)	Screening Toxicity Value (5)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (6)
742-99-05	Aluminum	2087.17		28287.67		mg/kg	SED-24D	10/10	N/A	28287.67	11074	2000000 N	100000	Reg IX PRG	NO	BSL,NUT
7440-38-2	Arsenic	5.27	B	25.74		mg/kg	SED-24D	10/10	N/A	25.74	7	3.8 C	0.4	EPA SSLs	YES	ASL,FD
7440-39-3	Barium	58.40	B	387.52		mg/kg	SED-24D	10/10	N/A	387.52	73.8	140000 N	5500	EPA SSLs	NO	BSL
7440-41-7	Beryllium	0.35	B	1.62	B	mg/kg	SED-24D	6/10	0.3 - 1.1	1.62	0.6	4100 N	1.75	East U.S.	NO	BSL,NUT
7440-43-9	Cadmium	5.28		83.68		mg/kg	SED-24D	10/10	N/A	83.68	13.2	2000 N	78	EPA SSLs	YES	ASL
7440-70-2	Calcium	35407.43	*J	144801.55	*J	mg/kg	SED-24D	10/10	N/A	144801.55	39731	N/A	39731 (SB)	NYS TAGM	NO	NUT
7440-47-3	Chromium	5.29	BN*J	1766.68	N*J	mg/kg	SED-24	10/10	N/A	1766.68	84	N/A	390	EPA SSLs	YES	ASL
7440-48-4	Cobalt	1.73	B	31.12	B	mg/kg	SED-24D	10/10	N/A	31.12	10.4	120000 N	100000	Reg IX PRG	NO	BSL
7440-50-8	Copper	12.71		498.16	N*J	mg/kg	SED-24D	10/10	N/A	498.16	80	82000 N	76000	Reg IX PRG	NO	BSL
7439-89-6	Iron	7399.83		57252.37		mg/kg	SED-24D	10/10	N/A	57252.37	20688	610000 N	100000	Reg IX PRG	NO	BSL
7439-92-1	Lead	8.15	*J	8.15	*J	mg/kg	SED-25	1/1	N/A	8.15	BDL	N/A	400	EPA SSLs	NO	BSL
7439-95-4	Magnesium	3233.20	B*J	37003.86	*J	mg/kg	SED-24D	10/10	N/A	37003.86	11019	N/A	11019 (SB)	NYS TAGM	NO	NUT
7439-96-5	Manganese	181.46	NJ	1132.51	NJ	mg/kg	SED-24D	10/10	N/A	1132.51	728	290000 N	32000	Reg IX PRG	NO	BSL,BKG
7439-97-6	Mercury	0.15	EJ	0.74		mg/kg	SED-24D	8/10	0.2 - 0.52	0.74	BDL	N/A	23	EPA SSLs	NO	BSL
7440-02-0	Nickel	11.41	BN*J	363.00	N*J	mg/kg	SED-24D	9/10	11.4	363.00	47	41000 N	1600	EPA SSLs	NO	BSL
7440-09-7	Potassium	217.59	BEJ	4895.68	EJ	mg/kg	SED-24D	10/10	N/A	4895.68	1561	N/A	1561 (SB)	NYS TAGM	NO	NUT
7782-49-2	Selenium	1.97	BNJ	1.97	BNJ	mg/kg	SED-23	1/10	1.5 - 5.3	1.97	BDL	10000 N	390	EPA SSLs	NO	BSL
7440-22-4	Silver	1.72	B	8.69	BNJ	mg/kg	SED-24D	8/10	0.5 - 1.7	8.69	BDL	10000 N	390	EPA SSLs	NO	BSL
7440-23-5	Sodium	1165.51	B	4665.88		mg/kg	SED-24D	9/10	1319	4665.88	2156	N/A	2156 (SB)	NYS TAGM	NO	NUT
7440-28-0	Thallium	2.28	ENJ	2.28	ENJ	mg/kg	SED-23	1/10	1.7 - 6.1	2.28	BDL	140 N	130	Reg IX PRG	NO	BSL
7440-62-2	Vanadium	11.82	B	76.71		mg/kg	SED-24D	10/10	N/A	76.71	22.3	14000 N	550	EPA SSLs	NO	BSL
7440-66-6	Zinc	44.06	ENJ	1185.11	ENJ	mg/kg	SED-24D	10/10	N/A	1185.11	106	610000 N	23000	EPA SSLs	NO	BSL
57-12-5	Cyanide	2.24	NJ	11.67	NJ	mg/kg	SED-24	7/10	1 - 3	11.67	4	N/A	NA	NA	NO	NTX

(1) Minimum/maximum detected concentration.

(2) Total of 10 sediment samples (from Ley Creek and on-site drainageways) used in COC screen. Refer to text for further discussion.

(3) Maximum concentration used for screening.

(4) Off-Site sample SED-20 used as background sample - Refer to text for supporting information.

(5) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Industrial soil used. (Cancer benchmark value = 1E-06; HQ=0.1)

(6) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient or common earth mineral (NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
EPA SSLs= EPA Generic Soil Screening Levels.
Reg IX PRG = EPA Region IX Preliminary Remediation Goals.
NYS TAGM = New York State Technical Administrative Guidance Manual (soil guidance values).
East U.S.= Eastern U.S. background range.
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

TABLE 6-7
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value (4)	Screening Toxicity Value (5)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (6)
207-08-9	Benzo(k)fluoranthene	10	J	10	J	ug/l	SW-23, -24	2/5	9 - 10	10	N/A	0.92 C	0.92	Reg IX PRG	YES	ASL
12672-29-6	Aroclor-1248	0.095	JP	0.14	JP	ug/l	SW-23	2/5	0.94 - 0.95	0.14	N/A	0.033 C	0.5	MCL	YES	ASL
742-99-05	Aluminum	136.56		237.65		ug/l	SW-24	5/5	NA	237.65	217	37000 N	50	SMCL	NO	NUT,BKG,BSL
7440-39-3	Barium	50.18	B	77.83	B	ug/l	SW-24	5/5	NA	77.83	63.9	2600 N	2000	MCL	NO	BKG,BSL
7440-70-2	Calcium	40240.00		94166.00		ug/l	SW-23	5/5	NA	94166.00	70050	N/A	NA	NA	NO	NUT,BKG,NTX
7440-47-3	Chromium	2.29	B	2.29	B	ug/l	SW-24	1/5	1.8 - 1.8	2.29	BDL	N/A	100	MCL	NO	BSL,IFD
7440-48-4	Copper	6.44	B	12.71	B	ug/l	SW-25	5/5	NA	12.71	5.5	1500 N	1300	MCL	NO	BSL
7439-89-6	Iron	444.39		701.59		ug/l	SW-24	5/5	NA	701.59	576.4	11000 N	300	SMCL	NO	NUT,BKG
7439-92-1	Lead	2.07	J	5.56	J	ug/l	SW-24	5/5	NA	5.56	3.3	N/A	15	MCL	NO	BKG,BSL
7439-95-4	Magnesium	8358.50		16045.00		ug/l	SW-24	5/5	NA	16045.00	11143	N/A	35000	NYS TOGS	NO	NTX,BKG,BSL,NUT
7439-96-5	Manganese	80.21		217.25		ug/l	SW-25	5/5	NA	217.25	80.8	730 N	50	SMCL	YES	ASL
7440-02-0	Nickel	2.36	B	2.96	B	ug/l	SW-24	4/5	1.9 - 1.9	2.96	1.9	730 N	1000	MCL	NO	BSL,BKG
7440-09-7	Potassium	3664.90	B	4096.00	B	ug/l	SW-24	5/5	NA	4096.00	3862	N/A	NA	NA	NO	NUT,BKG,NTX
7440-23-5	Sodium	50466.00		85413.00		ug/l	SW-24	5/5	NA	85413.00	57471	N/A	20000	NYS TOGS	NO	NUT,BKG,NTX
7440-62-2	Vanadium	1.49	B	1.79	B	ug/l	SW-23	3/5	1.3 - 1.3	1.79	1.3	260 N	260	Reg IX PRG	NO	BSL,BKG
7440-66-6	Zinc	18.95	B	53.10		ug/l	SW-22	5/5	NA	53.10	19	11000 N	11000	Reg IX PRG	NO	BSL
57-12-5	Cyanide	13.60		18.60		ug/l	SW-21	3/5	10 - 10	18.60	BDL	N/A	200	MCL	NO	NTX,BSL

(1) Minimum/maximum detected concentration.
(2) Total of 5 surface water samples from Ley Creek and on-site drainageways used in COC screening.
(3) Maximum concentration used for screening.
(4) Off-Site sample SW-20 used as background sample - Refer to text for supporting information.
(5) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Tap Water used.
(Cancer benchmark value = 1E-06; HQ=0.1)
(6) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
Reg IX PRG = EPA Region IX Preliminary Remediation Goals
NYS TOGS = New York State Technical and Operational Guidance Series for groundwater criteria.
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

TABLE 6-8
TOWN OF SALINA LANDFILL
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Scenario Timeframe: Current/Future
Medium: Leachate
Exposure Medium: Leachate
Exposure Point: On-Site

CAS Number	Chemical	Minimum Concentration (1)	Minimum Qualifier	Maximum Concentration (1)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits	Concentration (3) Used for Screening	Background Value	Screening Toxicity Value (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection (5)
71-43-2	Benzene	3.8	J	3.8	J	ug/l	L-1	1/3	10 - 10	3.8	N/A	0.32 C	5	MCL	YES	ASL,TX
108-90-7	Chlorobenzene	10.3		22		ug/l	L-1	2/3	10	22	N/A	110 N	110	Reg IX PRG	NO	BSL
106-46-7	1,4-Dichlorobenzene	2	J	2.2	J	ug/l	L-1	2/3	10	2.2	N/A	0.47 C	75	MCL	YES	ASL
12672-29-6	Aroclor-1248	0.70	JP	1.00	JP	ug/l	L-1, -2	3/3	NA	1.00	N/A	0.033 C	0.5	MCL	YES	ASL
7429-90-5	Aluminum	1051.50	ENJ	12131.00	ENJ	ug/l	L-2	3/3	NA	12131.00	N/A	37000 N	50	SMCL	NO	BSL,NUT
7440-39-3	Barium	460.40	EJ	1501.60	EJ	ug/l	L-2	3/3	NA	1501.60	N/A	2600 N	2000	MCL	NO	BSL
7440-70-2	Calcium	219970.00	ENJ	263910.00	ENJ	ug/l	L-2	3/3	NA	263910.00	N/A	N/A	NA	NA	NO	NTX,NUT
7440-47-3	Chromium	42.10	EJ	125.69	EJ	ug/l	L-2	3/3	NA	125.69	N/A	N/A	100	MCL	YES	ASL
7440-48-4	Cobalt	3.36	B	13.04	B		L-2	3/3	NA	13.04	N/A	2200 N	2200	Reg IX PRG	NO	BSL
7440-50-8	Copper	29.99	EJ	140.39	EJ	ug/l	L-2	3/3	NA	140.39	N/A	1500 N	1300	MCL	NO	BSL
7439-89-6	Iron	31183.00	EJ	156090.00	EJ	ug/l	L-2	3/3	NA	156090.00	N/A	11000 N	300	SMCL	NO	NUT
7439-92-1	Lead	29.43	EJ	198.93	EJ	ug/l	L-2	3/3	NA	198.93	N/A	N/A	15	MCL	YES	ASL,TX
7439-95-4	Magnesium	52694.00	EJ	69371.00	EJ	ug/l	L-2	3/3	NA	69371.00	N/A	N/A	35000	NYS TOGS	NO	NUT
7439-96-5	Manganese	412.49	EJ	1000.80	EJ	ug/l	L-6	3/3	NA	1000.80	N/A	730 N	50	SMCL	YES	ASL
7440-02-0	Nickel	40.36		63.09		ug/l	L-6	3/3	NA	63.09	N/A	730 N	1000	MCL	NO	BSL
7440-09-7	Potassium	42867.00	EJ	66501.00	EJ	ug/l	L-6	3/3	NA	66501.00	N/A	N/A	NA	NA	NO	NUT
7440-22-4	Silver	1.60	B	1.60	B	ug/l	L-2	1/3	1.6 - 1.6	1.60	N/A	180 N	180	Reg IX PRG	NO	BSL
7440-23-5	Sodium	67612.00	EJ	190190.00	EJ	ug/l	L-6	3/3	NA	190190.00	N/A	N/A	20000	NYS TOGS	NO	NUT
7440-62-2	Vanadium	19.33	B	19.33	B	ug/l	L-2	1/3	1.3 - 1.3	19.33	N/A	260 N	260	Reg IX PRG	NO	BSL
7440-66-6	Zinc	91.08	EJ	403.63	EJ	ug/l	L-2	3/3	NA	403.63	N/A	11000 N	11000	Reg IX PRG	NO	BSL

(1) Minimum/maximum detected concentration.
(2) Total of 3 on-site leachate samples used in COC screening.
(3) Maximum concentration used for screening.
(4) Risk-Based Concentration Table, Oct. 5, 2000. USEPA Region III. Values for Tap Water used.
(Cancer benchmark value = 1E-06; HQ=0.1)
(5) Rationale Codes
Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

Definitions:
N/A = Not Applicable
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
Reg IX PRG = EPA Region IX Preliminary Remediation Goals
NYS TOGS = New York State Technical and Operational Guidance Series for groundwater criteria
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic
BDL = below detection limits

during the screening of surface and subsurface soils in this human health risk assessment. In addition, a sediment and surface water sample location was considered to be a background or control point because it was located off-site and upstream of the site.

Discussions of potential COCs retained for each media are included below.

6.3.1 Surface Soils

Analytical results for surface soils were compared to USEPA Region III RBCs (industrial soil levels), Region IX PRGs (industrial soil levels), and Generic SSLs. Concentrations found in two off-site surface soil samples (SS-40 and SS-41) were also considered in the evaluation of potential surface soil COCs. Table 6-3 summarizes the potential COC selection process for surface soils.

Eight potential COCs were identified in surface soils: benzo(a) anthracene, benzo (b) fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, Aroclor 1248, arsenic, and lead. None of the VOC constituents that were analyzed for had maximum values that exceeded the above-listed screening criteria; thus, no VOCs were considered further as potential COCs in surface soils. Of the VOCs, only bromoform and methylene chloride, a common laboratory artifact/contaminant, were detected but at concentrations well below the soil screening criteria. Thirteen pesticide compounds were detected; however, none of the pesticide compounds were detected above the RBC, SSL, or PRG values.

Twenty-three SVOCs were detected in surface soils. Of these compounds, five had concentrations that were above the COC screening criteria. Benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were all retained as potential COCs. These five SVOCs were all detected at concentrations above the screening levels that were applied. In addition, the maximum concentration detected for each of these SVOCs was greater than one order of magnitude above the cleanup objective. All five of these SVOCs were also identified as potential COCs in other on-site media. One PCB, Aroclor 1248, was identified as a potential COC in surface soil, since it was detected at a concentration of 8400 ug/kg, which exceeded the screening criteria.

Of the metals, arsenic and lead were retained as potential COCs. Each of the parameters was detected at concentrations that were above the RBCs, PRGs, and SSLs that were used in the screening process. Arsenic and lead were also retained as potential COCs in other matrices. Table 6-3 summarizes the results of the surface soil COC screening process, and provides additional information on the rationales employed for identifying or eliminating chemicals as potential COCs.

6.3.2 Subsurface Soils

Analytical results for subsurface soils were compared to USEPA Region III RBCs (industrial soil levels), Region IX PRGs (industrial soil levels), and Generic SSLs. Concentrations found in two off-site surface soil samples (SS-40 and SS-41) were also considered in the evaluation of potential subsurface soil COCs. Table 6-4 summarizes the potential COC selection process for subsurface soils.

Nine potential COCs were identified for on-site subsurface soils: benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, Aroclor 1248, arsenic, chromium, and lead. Although nineteen VOCs were detected in subsurface soils, none were retained as potential COCs as they were below the screening levels. No pesticide compounds were detected in any of the subsurface soil samples analyzed. One PCB, Aroclor 1248, was detected at a concentration that exceeded both the EPA Region III RBC and SSL.

Of the SVOCs analyzed for, twenty-six were detected. Five compounds (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene) were retained as potential COCs, as each of these parameters were found at concentrations above the screening criteria. In addition, these SVOCs were also retained as potential COCs in other on-site matrices.

Three metals were retained as potential COCs: arsenic, chromium, and lead. Of the detected levels of each of these metals, at least some of the concentrations were above the screening criteria. They were also determined to be potential COCs in other on-site media. Table 6-4 summarizes the results of the subsurface soil COC screening process, and provides additional information on the rationales employed for identifying or eliminating chemicals as potential COCs.

6.3.3 Groundwater

Analytical results for groundwater were compared to EPA Region III tap water RBCs and Region IX PRGs (tap water). In some instances, EPA maximum contaminant levels (MCLs) were also considered in the COC screening process. Table 6-5 summarizes the potential COC selection process for on-site groundwater.

A total of nineteen potential COCs were identified for on-site groundwater, including ten VOCs, two SVOCs, one pesticide, one PCB compound, and five metals. The VOCs selected as potential

COCs include: benzene, toluene, xylenes, 1,2-DCE, 1,1,1-trichloroethane (1,1,1-TCA), TCE, 1,1-DCE, vinyl chloride, chloroethane, and chloromethane. Each of these compounds was detected at a concentration exceeding the screening criteria.

Fourteen SVOCs were detected in the groundwater samples, and two (1,4 dichlorobenzene and naphthalene) were retained as potential COCs since they were found in groundwater at concentrations above the screening levels.

A total of six pesticides were detected in the groundwater samples. Only one, aldrin, was present at a maximum concentration (0.0098 μg/l) that was above the criteria used to screen for COCs. It was thus retained as a potential groundwater COC. Aroclor 1248 was also retained as a potential COC since it was detected at a level above the applicable criteria in all six of the samples in which it was detected. In addition, this PCB compound was detected and identified as a potential COC in other on-site matrices.

Total metals concentrations were used in the potential COC analysis for groundwater. Five metals, arsenic, cadmium, chromium, lead, and manganese, were identified as potential COCs. Table 6-5 summarizes the results of the groundwater COC screening process, and provides additional information on the rationales employed for identifying or eliminating chemicals as potential COCs.

6.3.4 Sediment

Possible exposure pathways associated with and data pertaining to sediment from on-site drainageways was discussed above in Section 6.2. As alluded to, sediments will not be evaluated further in the quantitative risk assessment. However, potential sediment COCs were identified using the 1998 – 1999 RI data for samples collected on-site and in Ley Creek. Table 6-6 summarizes the sediment COC identification process. For purposes of this risk assessment, ten sediment samples (i.e., samples located on-site [Ley Creek: SED-21/SED-21D, -22/22D, and –23/23D; northern property line: SED-25/25D] and downstream [SED-24/24D in Ley Creek]) were included in the potential COC analysis. To identify potential COCs in sediments, analytical results were compared to USEPA Region III RBCs (industrial soil levels), Region IX PRGs (industrial soil levels), and Generic SSLs and to concentrations found in an off-site, upgradient sediment sample location (SED-20/20D). Table 6-6 summarizes the potential COC selection process for sediments.

Ten potential COCs were identified in sediment. These constituents include five SVOCs, two PCBs, and three metals. No VOCs or pesticides were retained. The SVOCs considered as potential

COCs in sediment include benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Each of these compounds was detected at levels above the applicable screening criteria. Two PCB compounds, Aroclor 1248 and Aroclor 1260, were identified as potential COCs in sediment. Aroclor 1248 was detected in 8 of 10 samples; all concentrations exceeded at least one of the screening criteria. Similarly, Aroclor 1260 was detected in 8 of 10 samples, with detected concentrations above the criteria.

Arsenic, cadmium, and chromium were retained as potential COCs due to high frequency of detection (i.e., ten of ten samples) and the concentrations detected were greater than the COC screening levels. Table 6-6 summarizes the results of the sediment COC screening process, and provides additional information on the rationales employed for identifying or eliminating chemicals as potential COCs.

6.3.5 Surface Water

Possible exposure pathways associated with and data pertaining to surface water from on-site drainageways was discussed above in Section 6.2. As alluded to, surface water will not be evaluated further in the quantitative risk assessment. However, potential surface water COCs were identified using the 1998 – 1999 RI data for samples collected on-site and in Ley Creek. Table 6-7 summarizes the surface water COC identification process. Five surface water samples (on-site [Ley Creek: SW-21, -22, and –23; northern property line: SW-25] and downstream [SW-24 in Ley Creek]) were included in the potential COC analysis. Analytical surface water results were compared to EPA Region III tap water RBCs and Region IX PRGs (tap water). In some instances, EPA maximum contaminant levels (MCLs) were also considered in the COC screening process. Concentrations found in an off-site, upgradient sample (SW-20) were also used in the evaluation of potential inorganic surface water COCs.

Three potential COCs, benzo(k)fluoranthene, Aroclor 1248, and manganese were identified for surface water, based on maximum concentrations that were detected. No VOCs or pesticides were detected in any of the five samples. Table 6-7 summarizes the results of the surface water COC screening process, and provides additional information on the rationales employed for identifying or eliminating chemicals as potential COCs.

6.3.6 Leachate

Three leachate samples were included in the COC evaluation process. Analytical results for leachate were compared to EPA Region III tap water RBCs and Region IX PRGs (tap water). In some instances, EPA maximum contaminant levels (MCLs) were also considered in the COC screening process. The potential COCs for leachate are summarized in Table 6-8.

Six potential COCs, benzene, 1,4 dichlorobenzene, Aroclor 1248, chromium, lead, and manganese, were retained as potential COCs in on-site leachate. Each parameter was detected at levels above the screening criteria. In addition, these parameters were also considered as potential COCs in other media. No pesticides were detected in the on-site leachate samples. Table 6-8 summarizes the results of the leachate COC screening process, and provides additional information on the rationales employed for identifying or eliminating chemicals as potential COCs.

6.4 EXPOSURE ASSESSMENT

As discussed previously, quantitative exposure assessments were not conducted for sediments and surface water (these on-site media are discussed qualitatively in Section 6.2). Quantitative exposure assessments were conducted for other on-site media that were identified as presenting potential exposure pathways in the current and future land use scenarios. These media include surface soil (current and future land use scenarios), subsurface soil (future land use scenario), groundwater (future land use scenario), and leachate (current and future land use scenarios). Exposure pathways are discussed in Section 6.2 and summarized in Table 6-2.

6.4.1 Exposure Concentrations

To calculate the amount of a chemical that may be ingested or dermally absorbed, the concentration of that chemical in the matrix to which humans may be exposed must be determined. This exposure concentration is often an average of the contaminant concentrations present throughout the matrix. Because of the uncertainties associated with any measurement of contaminant concentrations in the environment, the 95% upper confidence limit on the arithmetic average of the measured concentrations of the COCs is typically used in risk assessment calculations (EPA 1989). This value provides an estimate of the reasonable maximum concentration to which a population may be exposed. For this human health risk assessment, the maximum contaminant concentration for each parameter was used as the reasonable maximum exposure (RME) concentrations when less than 10 samples exist in a data set (i.e., subsurface soil and leachate), since there are too few data to reliably set a 95% upper confidence limit on the arithmetic mean.

For matrices with data sets consisting of 10 or more samples (i.e., surface soil and groundwater) the lower of the maximum contaminant concentration and the 95% upper confidence limit on the arithmetic mean for each parameter was used as the reasonable maximum exposure concentrations. For these two matrices, the data were first statistically evaluated to determine whether the data are normally or log-normally distributed (EPA 1992a, Gilbert). As the distributions generated from the surface soil and groundwater data failed the Shapiro-Wilk W test (and others) for normality, it was assumed that the distributions for these two media were log-normally distributed. Statistical evaluations of the data are included in Appendix E-1. For chemical parameters that were not detected in certain media samples, one half of the sample quantitation limit was used as a proxy concentration in the statistical analyses. Tables 6-9 through 6-12 provide summaries of the medium-specific exposure point concentrations (EPCs) and calculations/rationales applied.

6.4.2 Estimation of Chemical Intakes

Intake Equation: Chemical intake is defined as the estimated chemical-specific exposure for each pathway expressed in terms of mass of substance in contact with the body per unit body weight per unit time (i.e., mg/kg-day). The general equation for calculation of chemical intakes is as follows:

$$\text{Chronic daily intake} = \frac{C \times CR \times EF \times ED}{BW \times AT}$$

where:

- C = chemical concentration; the maximum concentration contacted in the medium over the exposure period
- CR = contact rate; the amount of contaminated matrix contacted per unit time or event
- EF = exposure frequency
- ED = exposure duration
- BW = body weight; the average body weight of the exposed population over the exposure period
- AT = averaging time; period over which the exposure is averaged

The values of the variables in the chemical intake equation are dependent on the exposure pathway under consideration as well as on site-specific and exposed population characteristics. Values for the chemical-intake equation variables are selected so as to estimate the reasonable maximum exposure (EPA 1989), defined as the highest exposure level that may reasonably be expected to

TABLE 6-9
TOWN OF SALINA LANDFILL
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	ug/kg	1988.15	N/A (1)	8800	D	mg/kg	7.77	95% UCL -T	W- Test (1)
Benzo(a)pyrene	ug/kg	1879.37	N/A (1)	8700	D	mg/kg	7.77	95% UCL -T	W- Test (1)
Benzo(b)fluoranthene	ug/kg	3131.48	N/A (1)	13900		mg/kg	12.6	95% UCL -T	W- Test (1)
Dibenz(a,h)anthracene	ug/kg	494.16	N/A (1)	960		mg/kg	0.96	Max	W- Test (1,2)
Indeno(1,2,3-cd)pyrene	ug/kg	1548.74	N/A (1)	5000	D	mg/kg	4.8	95% UCL -T	W- Test (1)
Aroclor 1248	ug/kg	491.76	N/A (1)	8400	J	mg/kg	1.08	95% UCL -T	W- Test (1)
Arsenic	mg/kg	2.18	N/A (1)	7		mg/kg	4.74	95% UCL -T	W- Test (1)
Lead	mg/kg	136	N/A (1)	1163		mg/kg	383.6	95% UCL -T	W- Test (1)

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T).

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.
(1) Shapiro-Wilk W Tset indicates that data are log-normally distributed.
(2) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
Lower of maximum concentration and 95% UCL concentration selected as medium EPC value.

TABLE 6-10
TOWN OF SALINA LANDFILL
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: On-Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	ug/kg	2151.88	N/A	16000		mg/kg	8.60	MAX	less than 10 samples.
Benzo(a)pyrene	ug/kg	2351.88	N/A	11700		mg/kg	11.70	MAX	less than 10 samples.
Benzo(b)fluoranthene	ug/kg	4033.13	N/A	22200		mg/kg	22.20	MAX	less than 10 samples.
Dibenz(a,h)anthracene	ug/kg	991.88	N/A	1500	J	mg/kg	1.50	MAX	less than 10 samples.
Indeno(1,2,3-cd)pyrene	ug/kg	1383.13	N/A	5200	J	mg/kg	5.20	MAX	less than 10 samples.
Aroclor 1248	ug/kg	84715.88	N/A	420000	PDJ	mg/kg	420.00	MAX	less than 10 samples.
Arsenic	mg/kg	8.26	N/A	21	N	mg/kg	20.80	MAX	less than 10 samples.
Chromium	mg/kg	876.14	N/A	4265			4265.03	MAX	less than 10 samples.
Lead	mg/kg	105.56	N/A	418	NJ	mg/kg	417.91	MAX	less than 10 samples.

Since subsurface soil data set has less than 10 values for all parameters, the maximum concentrations were used as EPCs.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

TABLE 6-11
TOWN OF SALINA LANDFILL
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: On-Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,1,1-TCA	ug/l	170.48	N/A (1)	2800	DJ	mg/l	0.0939	95% UCL-T	W- Test (1)
1,1-DCE	ug/l	27.21	N/A (1)	360	EG	mg/l	0.0517	95% UCL-T	W- Test (1)
1,2-DCE (total)	ug/l	2258.44	N/A (1)	38011	DG	mg/l	4.7	95% UCL-T	W- Test (1)
TCE	ug/l	39.10	N/A (1)	570	EG	mg/l	0.071	95% UCL-T	W- Test (1)
Vinyl Chloride	ug/l	55.53	N/A (1)	740	EG	mg/l	0.118	95% UCL-T	W- Test (1)
Benzene	ug/l	7.52	N/A (1)	29	G	mg/l	0.015	95% UCL-T	W- Test (1)
Chloroethane	ug/l	13.72	N/A (1)	94		mg/l	0.0295	95% UCL-T	W- Test (1)
Chloromethane	ug/l	8.60	N/A (1)	47	G	mg/l	0.0187	95% UCL-T	W- Test (1)
Toluene	ug/l	3594.19	N/A (1)	61000	DG	mg/l	1.59	95% UCL-T	W- Test (1)
Xylenes	ug/l	1058.85	N/A (1)	17900	DJ	mg/l	1.58	95% UCL-T	W- Test (1)
1,4 Dichlorobenzene	ug/l	4.82	N/A (1)	9	J	mg/l	0.009	max	W- Test (1,2)
Naphthalene	ug/l	6.15	N/A (1)	36	G	mg/l	0.0122	95% UCL-T	W- Test (1)
Aldrin	ug/l	0.02	N/A (1)	0.0098	JP	mg/l	0.00001	max	W- Test (1,2)
Aroclor 1248	ug/l	0.54	N/A (1)	1.60		mg/l	0.00157	95% UCL-T	W- Test (1)
Arsenic	ug/l	11.28	N/A (1)	74		mg/l	0.033	95% UCL-T	W- Test (1)
Cadmium	ug/l	13.00	N/A (1)	34		mg/l	0.034	max	W- Test (1,2)
Chromium	ug/l	36.99	N/A (1)	309		mg/l	0.152	95% UCL-T	W- Test (1)
Lead	ug/l	12.31	N/A (1)	52		mg/l	0.0466	95% UCL-T	W- Test (1)
Manganese	ug/l	801.91	N/A (1)	3710		mg/l	2.95	95% UCL-T	W- Test (1)

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T).

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.
(1) Shapiro-Wilk W Test indicates that data are log-normally distributed.
(2) 95% UCL exceeded maximum detected concentration. Therefore, maximum concentration used for EPC.
Lower of maximum concentration and 95% UCL concentration selected as medium EPC value.

TABLE 6-12
TOWN OF SALINA LANDFILL
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Scenario Timeframe: Current/Future
Medium: Leachate
Exposure Medium: Leachate
Exposure Point: On-Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	ug/l	4.73	N/A	3.80	J	mg/l	0.0038	MAX	less than 10 samples.
1,4 Dichlorobenzene	ug/l	3.03	N/A	2.20	J	mg/l	0.0022	MAX	less than 10 samples.
Aroclor 1248	ug/l	0.90	N/A	1.00	JP	mg/l	0.001	MAX	less than 10 samples.
Chromium	ug/l	91.40	N/A	126	EJ	mg/l	0.126	MAX	less than 10 samples.
Lead	ug/l	116.16	N/A	199	EJ	mg/l	0.199		
Manganese	ug/l	715.94	N/A	1001	EJ	mg/l	1.00	MAX	less than 10 samples.

Since leachate data set has less than 10 values for all parameters, the maximum concentrations were used as EPCs.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

occur at the site. This approach provides a conservative (i.e., "high") estimate of the risk that is above the average circumstance but still within the range of possible exposures.

Tables 6-13 through 6-19 present the values used for the estimations of chemical intakes associated with the current and future exposure pathways of interest in this risk assessment. The contaminant concentrations used in the intake equations were the exposure point concentrations (EPCs) previously discussed (see Tables 6-9 through 6-12). Where available, the remaining exposure variable values were obtained from the EPA guidance document *Standard Default Exposure Factors* (EPA 1991), other available guidance (EPA 1992, EPA 1997a), and professional judgement. The guidance from which a value was obtained is referenced in Tables 6-13 through 6-19. All intake values calculated for the site were chronic daily intakes.

Current Land Use Scenario: Chemical intakes were calculated for four potential exposure pathways under the current land use scenario: ingestion of chemicals in surface soils, dermal contact with chemicals in surface soils, ingestion of chemicals in leachate, and dermal contact with chemicals in leachate. Exposure variables for adults and children 6 to 15 years old were considered for on-site trespassers. The exposure factors assumed for each of the potential exposure pathways are discussed below.

Surface Soils: Exposure via Ingestion (Child and Adult Trespasser): The exposure factors for the surface soil ingestion pathway are included in Table 6-13 (child trespasser) and Table 6-14 (adult trespasser). The ingestion of chemicals in surface soils assumed that children ages 6 to 15 may play at the landfill (trespasser scenario). Children under the age of 15 were assumed to be more sensitive to chemical exposures than older children and adults, who have greater body weights, while children under the age of 6 would be unlikely to spend a substantial amount of time at the landfill. The average soil ingestion rate for children over the age of 6 has been estimated at 100 mg/day (EPA 1997a). The exposure duration is 10 years based on continual childhood exposure from ages 6 to 15. The assumed exposure frequency of 56 days/year was based on trespassing at the site three days/week during the three summer months and one day/week during five spring and fall months. The average body weight of children ages 6 to 15 is 39.4 kg (EPA 1997a). Exposure variables for adult trespassers are summarized in Table 6-14.

Surface Soils: Exposure via Dermal Contact (Child and Adult Trespasser): The exposure factors for the dermal contact pathway, presented in Tables 6-13 (child) and 6-14 (adult), include similar assumptions for the ingestion of chemicals in surface soils (discussed above) for exposure durations, exposure frequencies, and body weights. The skin surface area available for contact with surface

TABBLE 6-13
TOWN OF SALINA LANDFILL
VALUES USED FOR DAILY INTAKE CALCULATIONS

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	chemical concentration in surface soil	mg/kg	see Table 6-9	see Table 6-9	Chronic Daily Intake (CDI) (mg/kg-day) = CSxIRxCFxFIxEFxEDx1/BWx1/AT
	IR	ingestion rate	mg soil/day	100	EPA 1997a	
	CF	conversion factor (10-6 kg/mg)	N/A	N/A	N/A	
	FI	fraction ingested from contamination	unitless	1	assumes all soil is contaminated	
	EF	exposure frequency	events/year	56	see text (1)	
	ED	exposure duration	years	10	children ages 6 - 15	
	BW	body weight	kg	39.4	EPA 1997a (2)	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	3650	based on 10 years	
Dermal	CS	chemical concentration in surface soil	mg/kg	see Table 6-9	see Table 6-9	CDI (mg/kg-day) = CSxCFxSAxAFxABSxEFxEDx1/BWx1/AT
	CF	conversion factor (10-6 kg/mg)	N/A	N/A	N/A	
	SA	skin surface area available for contact	cm^2	3380	see text.	
	AF	soil to skin adherence factor	mg/cm^2	2.7	see text.	
	ABS	absorption factor	unitless	varies	see text.	
	EF	exposure frequency	events/year	56	see text (1)	
	ED	exposure duration	years	10	children ages 6 - 15	
	BW	body weight	kg	39.4	EPA 1997a (2)	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	3650	based on 10 years	

(1) Based on professional judgment. 56 days/yr assumes 3 days/week during 3 summer months and 1 day/week during spring and fall [5 months].

(2) average body weight of children ages 6 to 15 years old.

TABLE 6-14
TOWN OF SALINA LANDFILL
VALUES USED FOR DAILY INTAKE CALCULATIONS

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	chemical concentration in surface soil	mg/kg	see Table 6-9	see Table 6-9	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	ingestion rate	mg soil/day	50	EPA 1997a	CSxIRxCFxFIxEFxEDx1/BWx1/AT
	CF	conversion factor (10-6 kg/mg)	N/A	N/A	N/A	
	FI	fraction ingested from contamination	unitless	1	assumes all soil is contaminated	
	EF	exposure frequency	events/year	56	see text (1)	
	ED	exposure duration	years	9	EPA 1997a	
	BW	body weight	kg	70	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	3285	based on 9 years	
Dermal	CS	chemical concentration in surface soil	mg/kg	see Table 6-9	see Table 6-9	CDI (mg/kg-day) =
	CF	conversion factor (10-6 kg/mg)	N/A	N/A	N/A	CSxCFxSAxAFxABSxEFxEDx1/BWx1/AT
	SA	skin surface area available for contact	cm^2	5560	see text.	
	AF	soil to skin adherence factor	mg/cm^2	0.3	see text.	
	ABS	absorption factor	unitless	varies	see text.	
	EF	exposure frequency	events/year	56	see text (1)	
	ED	exposure duration	years	9	EPA 1997a	
	BW	body weight	kg	70	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	3285	based on 9 years	

(1) Based on professional judgment. 56 days/yr assumes 3 days/week during 3 summer months and 1 day/week during spring and fall [5 months].

TABLE 6-15
TOWN OF SALINA LANDFILL
VALUES USED FOR DAILY INTAKE CALCULATIONS

Scenario Timeframe: Current/Future
Medium: Leachate
Exposure Medium: Leachate
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	chemical concentration in leachate	mg/l	see Table 6-12	see Table 6-12	Chronic Daily Intake (CDI) (mg/kg-day) =
	CR	Contact rate	liters/hour	0.05	EPA 1997a	CWxCRxETxEFxEDx1/BWx1/AT
	ET	exposure time	hours/day	1	prof judgment	
	EF	exposure frequency	events/year	56	see text (1)	
	ED	exposure duration	years	10	children ages 6-15	
	BW	body weight	kg	39.4	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	3650	based on 10 years	
Dermal	CW	chemical concentration in leachate	mg/l	see Table 6-12	see Table 6-12	CDI (mg/kg-day) =
	SA	skin surface area available for contact	cm^2	3380	see text.	CWxSAxPCxETxCFxEFxEDx1/BWx1/AT
	PC	chemical specific permeability constant	cm/hr	varies	see text.	
	CF	conversion factor for water	l/1000 cm^3	N/A	N/A	
	ET	exposure time	hours/day	1	prof judgment	
	EF	exposure frequency	events/year	56	see text (1)	
	ED	exposure duration	years	10	children ages 6-15	
	BW	body weight	kg	39.4	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	3650	based on 10 years	

(1) Based on professional judgment. 56 days/yr assumes 3 days/week during 3 summer months and 1 day/week during spring and fall [5 months].

TABLE 6-16
TOWN OF SALINA LANDFILL
VALUES USED FOR DAILY INTAKE CALCULATIONS
(Page 1 of 1)

Scenario Timeframe: Current/Future
Medium: Leachate
Exposure Medium: Leachate
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	chemical concentration in leachate	mg/l	see Table 6-12	see Table 6-12	Chronic Daily Intake (CDI) (mg/kg-day) =
	CR	Contact rate	liters/hour	0.05	EPA 1997a	CWxCRxETxEFxEDx1/BWx1/AT
	ET	exposure time	hours/day	1	prof judgment	
	EF	exposure frequency	events/year	56	see text (1)	
	ED	exposure duration	years	9	EPA 1997(a)	
	BW	body weight	kg	70	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	3285	based on 9 years	
Dermal	CW	chemical concentration in leachate	mg/l	see Table 6-12	see Table 6-12	CDI (mg/kg-day) =
	SA	skin surface area available for contact	cm^2	5560	see text.	CWxSAxPCxETxCFxEFxEDx1/BWx1/AT
	PC	chemical specific permeability constant	cm/hr	varies	see text.	
	CF	conversion factor for water	$l/1000\ cm^3$	N/A	N/A	
	ET	exposure time	hours/day	1	prof judgment	
	EF	exposure frequency	events/year	56	see text (1)	
	ED	exposure duration	years	9	EPA 1997(a)	
	BW	body weight	kg	70	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	3285	based on 9 years	

(1) Based on professional judgment. 56 days/yr assumes 3 days/week during 3 summer months and 1 day/week during spring and fall [5 months].

TABLE 6-17
TOWN OF SALINA LANDFILL
VALUES USED FOR DAILY INTAKE CALCULATIONS

(Page 1 of 1)

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	chemical concentration in surface soil	mg/kg	see Table 6-9	see Table 6-9	Chronic Daily Intake (CDI) (mg/kg-day) = CSxIRxCFxFIxEFxEDx1/BWx1/AT
	IR	ingestion rate	mg soil/day	480	EPA 1997a	
	CF	conversion factor (10-6 kg/mg)	N/A	N/A	N/A	
	FI	fraction ingested from contamination	unitless	1	assumes all soil is contaminated	
	EF	exposure frequency	events/year	120	see text (1)	
	ED	exposure duration	years	2	see text (1)	
	BW	body weight	kg	70	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	730	based on 2 years	
Dermal	CS	chemical concentration in surface soil	mg/kg	see Table 6-9	see Table 6-9	CDI (mg/kg-day) = CSxCFxSAxAFxABSxEFxEDx1/BWx1/AT
	CF	conversion factor (10-6 kg/mg)	N/A	N/A	N/A	
	SA	skin surface area available for contact	cm^2	5560	see text.	
	AF	soil to skin adherence factor	mg/cm^2	0.3	see text.	
	ABS	absorption factor	unitless	varies	see text.	
	EF	exposure frequency	events/year	120	see text (1)	
	ED	exposure duration	years	2	see text (1)	
	BW	body weight	kg	70	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	730	based on 2 years	

(1) Based on professional judgment.

TABLE 6-18
TOWN OF SALINA LANDFILL
VALUES USED FOR DAILY INTAKE CALCULATIONS

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: On-Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	chemical concentration in surface soil	mg/kg	see Table 6-10	see Table 6-10	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	ingestion rate	mg soil/day	480	EPA 1997a	CSxIRxCFxFIxEFxEDx1/BWx1/AT
	CF	conversion factor (10-6 kg/mg)	N/A	N/A	N/A	
	FI	fraction ingested from contamination	unitless	1	assumes all soil is contaminated	
	EF	exposure frequency	events/year	120	see text (1)	
	ED	exposure duration	years	2	see text (1)	
	BW	body weight	kg	70	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	730	based on 2 years	
Dermal	CS	chemical concentration in surface soil	mg/kg	see Table 6-10	see Table 6-10	CDI (mg/kg-day) =
	CF	conversion factor (10-6 kg/mg)	N/A	N/A	N/A	CSxCFxSAxAFxABSxEFxEDx1/BWx1/AT
	SA	skin surface area available for contact	cm^2	5560	see text.	
	AF	soil to skin adherence factor	mg/cm^2	0.3	see text.	
	ABS	absorption factor	unitless	varies	see text.	
	EF	exposure frequency	events/year	120	see text (1)	
	ED	exposure duration	years	2	see text (1)	
	BW	body weight	kg	70	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	730	based on 2 years	

(1) Based on professional judgment.

TABLE 6-19
TOWN OF SALINA LANDFILL
VALUES USED FOR DAILY INTAKE CALCULATIONS
(Page 1 of 1)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: On-Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	chemical concentration in leachate	mg/l	see Table 6-11	see Table 6-11	Chronic Daily Intake (CDI) (mg/kg-day) =
	CR	Contact rate	liters/hour	0.05	EPA 1997a	CWxCRxETxEFxEDx1/BWx1/AT
	ET	exposure time	hours/day	8	prof judgment	
	EF	exposure frequency	events/year	120	see text (1)	
	ED	exposure duration	years	2	see text (1)	
	BW	body weight	kg	70	EPA 1997a	
	AT-C	averaging time (cancer)	days	25,550	EPA, 1989.	
	AT-N	averaging time (noncancer)	days	730	based on 2 years	

(1) Based on professional judgement.

soils for children was assumed to be 3380 cm^2 (based on 11,800 cm^2 total body area value for children ages 9 to 15 times 28.7% of the body exposed on average for spring, summer, and fall [EPA 1997a]). A skin surface area value of 5560 cm^2 was used for adults, based on the same rationale.

The dermal contact chemical intake equation includes a factor for the absorption of the chemicals through the skin. The rate of absorption through skin is variable with the COC under consideration. Although few data and guidances are available on chemical absorption rates, 10% was applied for PAHs, except for benzo(a)pyrene (13% used). A factor of 14% was applied for PCBs, and 1% was used for the metals COCs, with the exception of arsenic (3%).

The dermal contact chemical intake equation also includes a factor for the soil-to-skin adherence factor. For this risk assessment, consensus factors from the Onondaga Lake subsites were used as follows: 2.7 mg/cm^2 (RME, children), and 0.3 mg/cm^2 (RME, adults).

<u>*Leachate: Exposure via Ingestion (Child and Adult Trespasser):*</u> The exposure factors for the leachate ingestion pathway are included in Tables 6-15 (child trespasser) and 6-16 (adult trespasser). For both the child and adult receptors, exposure frequency (56 days/yr), exposure duration, and body weight were identical to the above trespasser scenarios. A contact rate (incidental ingestion of surface water) of 50 ml/hr (EPA) was applied for both adults and children. Professional judgement was used to derive the exposure time (1 hr/day).

<u>*Leachate: Exposure via Dermal Contact (Child and Adult Trespasser):*</u> The exposure factors for this leachate pathway are presented in Tables 6-15 and 6-16. Exposure variables similar to those used in the leachate ingestion pathway and the surface soil dermal contact pathway were retained for the surface water dermal contact scenario. Skin surface area values of 3,380 cm^2 (children) and 5,560 cm^2 (adults) were used in the intake equation. Chemical-specific dermal permeability constants were applied for each chemical of concern, based on physical properties. The following permeability constants were used:

- Benzene: 0.02 cm/hr
- 1,4-dichlorobenzene: 0.087 cm/hr
- Aroclor 1248: 0.47 cm/hr
- Chromium: 0.001 cm/hr
- Lead: 0.001 cm/hr
- Manganese: 0.001 cm/hr

Future Land Use Scenario. Under the future land use scenario, chemical intakes were calculated for the same potential exposure pathways that were identified for children and adult trespassers in the current land use scenario: ingestion of chemicals in surface soil; dermal contact with chemicals in surface soil; ingestion of chemicals in leachate; and dermal contact with chemicals in leachate (refer to Tables 6-13 through 6-16). For purposes of this risk assessment, it was assumed that the chemical intakes in the future will be identical to those calculated under the current land use scenario.

For the potential on-site construction worker receptor in the future land use scenario, the following additional pathways were evaluated, as previously agreed upon: ingestion of and dermal contact with surface soil (Table 6-17); ingestion of and dermal contact with subsurface soil (Table 6-18); and incidental ingestion of groundwater (Table 6-19).

For the construction worker exposure pathways, values for intake calculations were based on EPA guidance and professional judgement. An ingestion rate of 480 mg/day was applied for surface soil and subsurface soil incidental ingestion rates (EPA, 1997a). For dermal contact with soil routes, the adult trespasser skin surface area (5560 cm^2) and adherence factors (0.3 mg/cm^2) were also used for the construction worker. As a construction worker is likely to wear more protective clothing (i.e., gloves) than a trespasser at any given time, these factors were considered to be conservative. For all three future construction worker pathways, it was assumed (conservatively, given the anticipated future use and zoning of the area) that a construction worker would spend 2 years working at the site. Thus, an exposure duration of 2 years was used in the intake calculations of Tables 6-17, 6-18, and 6-19. Given a typical 8 hr work day (or, one-third of a 24-hr exposure duration), an exposure frequency of about 120 days per year (about 365/3 days) was also assumed.

The chemical intake calculations for all potential human health exposure pathways (current and future scenarios) are included in Appendix E-2. These values were in turn used in calculations of hazard quotients (for noncancer risks) and cancer risks for the site, as described below.

6.5 TOXICITY ASSESSMENT

Assessing the toxicity of the COCs is the next step in evaluating the potential human health risks as a result of intake of these chemicals at the levels calculated. Adverse health effects that may result from exposure to a COC are identified, and the relationship between the applied dose and the incidence of adverse effects is quantified. Toxicity values (i.e., reference doses [RfDs] for noncarcinogenic effects and cancer slope factors [CSFs] for carcinogenic effects) are used to estimate the potential for adverse effects as a function of human exposure to the agent. The toxicity values for the COCs are then incorporated with the calculated chemical intakes in the risk characterization step (Section 6-6) to estimate the likelihood of adverse health effects as a result of exposure at the site. RfDs and CSFs are discussed in more detail below in Section 6.5.2.

A toxicity assessment was conducted by calculating a hazard quotient (noncancer evaluation) or cancer risk for each potential COC in each matrix according to the following equations:

- Noncarcinogenic effects:

$$HQ = \frac{Intake\ Concentration}{RfD}$$

  where RfD equals the reference dose.

- Carcinogenic effects:

$$CancerRisk = Intake\ Concentration\ x\ slope\ \ factor$$

The intake concentration used in these equations is the concentration derived for each COC in a particular matrix, as described above and in Appendix E-2.

Oral cancer slope factors (CSFs) and reference doses (RfDs) used in these equations were obtained from EPA's IRIS database (accessed 22 December 2000) and the Health Effects Assessment Summary Tables (EPA, 1997b). Note that RfDs and CSFs have not been established for all COCs. Thus, where practical, EPA-NCEA provisional toxicity values were also used in this risk assessment. Where applicable, dermal RfDs and CSFs were derived from the oral values based on EPA guidance. Table 6-20 summarizes the noncancer toxicity data for the site COCs. Table 6-21 provides a summary of the cancer toxicity data.

6.5.1 Hazard Identification

Tables 6-20 and 6-21 also include the currently documented health effects that have been associated with exposure to the potential site COCs: arsenic, cadmium, chromium, lead,

TABLE 6-20
TOWN OF SALINA LANDFILL
NON-CANCER TOXICITY DATA -- ORAL/DERMAL

(Page 1 of 1)

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor	Adjusted Dermal RfD	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ
1,1,1-Trichlorethane	N/A	2.8E-01 (1)	mg/kg-day	100%	2.8E-01 (1)	mg/kg-day	N/A	N/A	EPA-NCEA: N/A	2000
1,1-Dichloroethene	Chronic/Subchronic	9E-03	mg/kg-day	100%	9E-03	mg/kg-day	liver	1000	IRIS:HEAST	12/22/00: 1997
1,2-Dichloroethene (total)	Chronic/Subchronic	9E-03	mg/kg-day	100%	9E-03	mg/kg-day	liver	1000	HEAST: HEAST	1997
Benzene	N/A	3.0E-03 (1)	mg/kg-day	100%	3.0E-03 (1)	mg/kg-day	N/A	N/A	EPA-NCEA: N/A	2000
Chloroethane	N/A	4.0E-01 (1)	mg/kg-day	100%	4.0E-01 (1)	mg/kg-day	N/A	N/A	EPA-NCEA: N/A	2000
Chloromethane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Toluene	Chronic	2E-01	mg/kg-day	100%	2E-01	mg/kg-day	liver	1000	IRIS:HEAST	12/22/00: 1997
	Subchronic	2E+00	mg/kg-day	100%	2E+00	mg/kg-day	liver, kidney	100	HEAST: HEAST	06/19/05
Xylenes	Chronic	2E+00	mg/kg-day	100%	2E+00	mg/kg-day	liver	100	IRIS: IRIS	12/22/00
Trichloroethene	N/A	6.0E-03 (1)	mg/kg-day	100%	6.0E-03 (1)	mg/kg-day	N/A	N/A	EPA-NCEA: N/A	2000
Vinyl Chloride	Chronic	3.0E-03	mg/kg-day	100%	3.0E-03	mg/kg-day	liver	30	IRIS: IRIS	12/22/00
Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Naphthalene	Subchronic	2E-02	mg/kg-day	40%	8.0E-03	mg/kg-day	blood	3000	IRIS: IRIS	12/22/00
Aldrin	Chronic	3E-05	mg/kg-day	100%	3E-05	mg/kg-day	liver	1000	IRIS: HEAST	12/22/00: 1997
Arochlor 1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arochlor 1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic/Subchronic	3E-04	mg/kg-day	95%	2.9E-04	mg/kg-day	skin	3	IRIS: HEAST	12/22/00: 1997
Cadmium	Chronic	5E-04	mg/kg-day	4.6%	2.3E-05	mg/kg-day	kidney	10	IRIS: IRIS	12/22/00
Chromium (TOTAL)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	Chronic	1.4E-01	mg/kg-day	100%	1.4E-01	mg/kg-day	CNS	1	IRIS: HEAST	12/22/00: 1997

N/A = Not Applicable

(1) Indicates EPA-NCEA provisional value (derived from Region III RBC Tables 10/5/2000).

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

TABLE 6-21
TOWN OF SALINA LANDFILL
CANCER TOXICITY DATA -- ORAL/DERMAL

(Page 1 of 1)

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
1,1,1-Trichlorethane	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,1-Dichloroethene	6.0E-01	100%	6.0E-01	(mg/kg-day)$^{-1}$	C	IRIS	12/22/00
1,2-Dichloroethene (total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzene	5.50E-02	100%	5.50E-02	(mg/kg-day)$^{-1}$	A	IRIS	12/22/00
Chloroethane	2.90E-03	100%	2.90E-03	(mg/kg-day)$^{-1}$	N/A	EPA - NCEA (1)	2000
Chloromethane	1.30E-02	100%	1.30E-02	(mg/kg-day)$^{-1}$	C	HEAST	1997
Toluene	N/A	N/A	N/A	N/A	D	IRIS	12/22/00
Xylenes	N/A	N/A	N/A	N/A	D	IRIS	12/22/00
Trichloroethene	1.10E-02	100%	1.10E-02	(mg/kg-day)$^{-1}$	N/A	EPA - NCEA (1)	2000
Vinyl Chloride	7.20E-01	100%	7.20E-01	(mg/kg-day)$^{-1}$	A	IRIS	12/22/00
Benzo(a)anthracene	7.30E-01	40%	1.83E+00	(mg/kg-day)$^{-1}$	B2	IRIS/ EPA-NCEA(1)	2000
Benzo(a)pyrene	7.30E+00	40%	1.83E+01	(mg/kg-day)$^{-1}$	B2	IRIS	12/22/00
Benzo(b)fluoranthene	7.30E-01	40%	1.83E+00	(mg/kg-day)$^{-1}$	B2	IRIS/ EPA-NCEA(1)	2000
Benzo(k)fluoranthene	7.30E-02	40%	1.83E-01	(mg/kg-day)$^{-1}$	B2	IRIS/ EPA-NCEA(1)	2000
Dibenz(a,h)anthracene	7.30E+00	40%	1.83E+01	(mg/kg-day)$^{-1}$	B2	IRIS/ EPA-NCEA(1)	2000
Indeno(1,2,3-cd)pyrene	7.30E-01	40%	1.83E+00	(mg/kg-day)$^{-1}$	B2	IRIS/ EPA-NCEA(1)	2000
1,4-Dichlorobenzene	2.40E-02	40%	6.00E-02	(mg/kg-day)$^{-1}$	C	HEAST	1997
Naphthalene	N/A	N/A	N/A	(mg/kg-day)$^{-1}$	C	IRIS	12/22/00
Aldrin	1.70E+01	100%	1.70E+01	(mg/kg-day)$^{-1}$	B2	IRIS	12/22/00
Arochlor 1248	2.00E+00	96%	2.08E+00	(mg/kg-day)$^{-1}$	N/A	EPA - NCEA (1)	2000
Arochlor 1260	2.00E+00	96%	2.08E+00	(mg/kg-day)$^{-1}$	N/A	EPA - NCEA (1)	2000
Arsenic	1.50E+00	95%	1.58E+00	(mg/kg-day)$^{-1}$	A	IRIS	12/22/00
Cadmium	N/A	N/A	N/A	N/A	B1	IRIS	12/22/00
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	B2	IRIS	12/22/00
Manganese	N/A	N/A	N/A	N/A	D	IRIS	12/22/00

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables
(1) Indicates EPA-NCEA provisional slope factor value derived from Region III RBC Table (10/5/2000).

EPA Group:
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen
- E - Evidence of noncarcinogenicity

Weight of Evidence:
- Known/Likely
- Cannot be Determined
- No

manganese, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, 1,4-dichlorobenzene, naphthalene, aldrin, Aroclor 1248, Aroclor 1260, 1,1,1-Trichloroethane, 1,1-Dichloroethene, 1,2-Dichloroethene (total), benzene, chloroethane, chloromethane, toluene, xylenes, trichloroethene, and vinyl chloride. Both acute and chronic symptoms are included as well as noncarcinogenic and carcinogenic effects.

6.5.2 Toxicity Values

Based on human and animal toxicity studies, EPA has developed toxicity values to quantitatively define the relationship between dose and response. The toxicity values for the site COCs were obtained from the IRIS on-line database (accessed in December 2000). The IRIS database is the preferred source of toxicity values for use in human health risk evaluations. The database is maintained on-line to ensure that the most up-to-date information is available. The HEAST Report (EPA 1997b) was consulted when toxicity values were not available on IRIS. The HEAST tables contain interim toxicity values that have not been verified by the EPA workgroup responsible for approving toxicity values.

Toxicity values are provided for both noncarcinogenic and carcinogenic effects of chemicals. For this risk assessment, noncarcinogenic effects were evaluated through the use of RfDs. An RfD is an estimate of the daily exposure level for human populations, including sensitive subpopulations, that is not likely to result in adverse health effects for the exposed population. Reference doses, RfDs, are generally for ingestion of chemicals. RfDs were also applied to dermal contact exposure routes, by applying an oral-to-dermal adjustment factor when necessary, in this risk assessment (EPA). As no significant inhalation exposure routes were identified for COCs in any on-site medium, reference concentrations, RfCs, are not discussed.

Carcinogenic effects are evaluated through the use of slope factors. The use of slope factors as opposed to RfDs for carcinogenic effects results from the assumption that there is no threshold concentration of the compound to which humans may be exposed below which carcinogenesis does not occur. Instead, any exposure to a potentially carcinogenic compound poses a finite probability, however small, of generating a carcinogenic response. Therefore, slope factors are developed that are upper-bound estimates of the probability of a carcinogenic response per unit intake of a chemical over a lifetime. The slope factor is used to estimate the upper-bound probability of developing cancer as a result of exposure to a contaminant over a lifetime at a particular level (EPA 1989). The slope factors for the oral route were applied for both ingestion and dermal contact routes of exposure. However, an oral-to-dermal adjustment factor was first applied for some chemicals in order to evaluate dermal contact routes of exposure. Inhalation slope factors are not discussed, as no inhalation exposure pathways were identified.

Toxicity values for potential noncarcinogenic effects (i.e., RfDs) for the contaminants of concern at the site are included in Table 6-20. Toxicity values for potential carcinogenic effects (i.e., slope factors) are presented in Table 6-21. The origin of these values, generally either IRIS or the HEAST report, is indicated on these tables. The noncarcinogenic effects table includes the level of confidence in the RfDs by indicating the combined uncertainty and modifying factors that were used in calculation of the RfDs. Uncertainty factors (UFs) represent specific areas of uncertainty that result from extrapolation of toxicity values from available data (UFs can range from 1 to 10). EPA has established the following UFs:

- UF to account for variation in the general human population. This UF is intended to protect sensitive subpopulations, such as children.

- UF to account for extrapolation from animal studies to human studies.

- UF to account for a no-observed-adverse-effect-level (NOAEL), which was derived from a subchronic rather than a chronic study.

- UF to account for the use of a lowest-observed-adverse-effect-level (LOAEL) rather than a NOAEL.

In addition to UFs, a modifying factor (MF) ranging from 1 to 10 is applied to reflect EPA's assessment of the quality of the database used to derive the toxicity value.

The information on potential carcinogenic effects of the COCs includes the weight-of-evidence classification assigned to the compound by EPA. The classification system developed by EPA for the weight-of-evidence of carcinogenicity is included in Table 6-21 and indicates the strength of the evidence available concerning the carcinogenicity of the chemical to humans.

6.6 RISK CHARACTERIZATION

In risk characterization, the exposure assessment and toxicity assessment results are combined to obtain estimates of the risk to human health posed by the site. To characterize the risk for potential carcinogenic effects, the probability that a receptor will develop cancer over a lifetime of exposure is estimated from the chronic daily intake and the chemical-specific slope factor. Similarly, the risk of potential noncarcinogenic effects occurring is characterized by comparing the chronic daily intake for each chemical and pathway and the respective RfDs for those chemicals. Oral slope factors and RfDs were applied in the assessment of dermal exposures; however, an adjustment factor was applied for some parameters.

Oral and dermal hazard quotients and cancer risks for each potential COC in a matrix were found as described above. The total risk for each pathway was then calculated by summing the carcinogenic or noncarcinogenic risks for each chemical included in that pathway. Noncarcinogenic and carcinogenic effects were evaluated separately.

The calculations of noncancer hazards are provided in Tables 6-22 through 6-28 for the different exposure pathways and populations. Hazard quotients (HQs) were obtained for each COC, and then summed for each exposure route (i.e., ingestion and dermal contact). The cumulative HQs calculated for each exposure route were then summed to yield a total hazard index (HI) across all exposure routes for each medium and receptor population.

The calculations of the cancer risks for the various exposure pathways and receptors are summarized in Tables 6-29 through 6-35. Cancer risks were obtained for each COC, and then summed for each exposure route (i.e., ingestion or dermal contact). The cumulative cancer risks calculated for each exposure route were then summed to yield a total cancer risk across all exposure routes for each medium and receptor population.

The following sections present the characterizations of noncarcinogenic and carcinogenic risks that may be posed by the COCs at the site.

6.6.1 Noncarcinogenic Risk Estimate

The potential for noncarcinogenic health effects resulting from exposure to COCs at the levels calculated is evaluated by comparing the chronic daily intakes to the chemical-specific RfDs. The comparison is performed by calculating the hazard quotient, which is defined as the ratio of the chronic intake to the chronic RfD:

$$\text{Noncancer Hazard Quotient} = \frac{\text{Chronic Intake}}{\text{Chronic RfD}}$$

TABLE 6-22
TOWN OF SALINA LANDFILL
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	12.6	mg/kg	12.6	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	4.8	mg/kg	4.8	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arsenic	4.74	mg/kg	4.74	mg/kg	M	1.8E-06	mg/kg-day	3E-04	mg/kg-day	N/A	N/A	6.2E-03
	Lead	383.60	mg/kg	383.60	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	(total)												6.2E-03
Dermal													
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	12.60	mg/kg	12.6	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	4.80	mg/kg	4.8	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arsenic	4.74	mg/kg	4.74	mg/kg	M	5.1E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	1.77E-02
	Lead	383.60	mg/kg	383.60	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	(total)												1.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 6-23
TOWN OF SALINA LANDFILL
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	12.6	mg/kg	12.6	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	4.8	mg/kg	4.8	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arsenic	4.74E+00	mg/kg	4.74E+00	mg/kg	M	5.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.7E-03
	Lead	3.84E+02	mg/kg	3.84E+02	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	(total)												1.7E-03
Dermal													
	Benzo(a)anthracene	7.77E+00	mg/kg	7.77E+00	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	7.77E+00	mg/kg	7.77E+00	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.26E+01	mg/kg	1.26E+01	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	9.60E-01	mg/kg	9.60E-01	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	4.80E+00	mg/kg	4.80E+00	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arochlor 1248	1.08E+00	mg/kg	1.08E+00	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arsenic	4.74E+00	mg/kg	4.74E+00	mg/kg	M	5.2E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	1.82E-03
	Lead	3.84E+02	mg/kg	3.84E+02	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	(total)												1.8E-03
												Total Hazard Index Across All Exposure Routes/Pathways	3.6E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 6-24
TOWN OF SALINA LANDFILL
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Current/Future
Medium: Leachate
Exposure Medium: Leachate
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Benzene	0.0038	mg/l	0.0038	mg/l	M	7.4E-07	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.5E-04
	1,4-Dichlorobenzene	0.0022	mg/l	0.0022	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aroclor 1248	0.001	mg/l	0.001	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Chromium	0.126	mg/l	0.126	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Lead	0.199	mg/l	0.199	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	1	mg/l	1	mg/l	M	1.9E-04	mg/kg-day	1.4E-01	mg/kg-day	N/A	N/A	1.4E-03
	(total)												1.6E-03
Dermal													
	Benzene	0.0038	mg/l	0.0038	mg/l	M	1.0E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.33E-04
	1,4-Dichlorobenzene	0.0022	mg/l	0.0022	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aroclor 1248	0.001	mg/l	0.001	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Chromium	0.126	mg/l	0.126	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Lead	0.199	mg/l	0.199	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	1	mg/l	1	mg/l	M	1.3E-05	mg/kg-day	1.4E-01	mg/kg-day	N/A	N/A	9.40E-05
	(total)												4.3E-04
												Total Hazard Index Across All Exposure Routes/Pathways	2.1E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 6-25
TOWN OF SALINA LANDFILL
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Current/Future
Medium: Leachate
Exposure Medium: Leachate
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzene	0.0038	mg/l	0.0038	mg/l	M	4.2E-07	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.4E-04
	1,4-Dichlorobenzene	0.0022	mg/l	0.0022	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aroclor 1248	0.001	mg/l	0.001	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Chromium	0.126	mg/l	0.126	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Lead	0.199	mg/l	0.199	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	1	mg/l	1	mg/l	M	1.1E-04	mg/kg-day	1.4E-01	mg/kg-day	N/A	N/A	7.8E-04
	(total)												9.2E-04
Dermal	Benzene	0.0038	mg/l	3.80E-03	mg/l	M	9.3E-07	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.09E-04
	1,4-Dichlorobenzene	0.0022	mg/l	2.20E-03	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Aroclor 1248	0.001	mg/l	1.00E-03	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Chromium	0.126	mg/l	1.26E-01	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Lead	0.199	mg/l	1.99E-01	mg/l	M	N/A	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	Manganese	1	mg/l	1.00E+00	mg/l	M	1.2E-05	mg/kg-day	1.4E-01	mg/kg-day	N/A	N/A	8.70E-05
	(total)												4.0E-04
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 6-26
TOWN OF SALINA LANDFILL
CALCULATION OF NON-CANCER HAZARDS REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	12.6	mg/kg	12.6	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	4.8	mg/kg	4.8	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arsenic	4.74E+00	mg/kg	4.74E+00	mg/kg	M	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.6E-02
	Lead	3.84E+02	mg/kg	3.84E+02	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	(total)												3.6E-02
Dermal													
	Benzo(a)anthracene	7.77E+00	mg/kg	7.77E+00	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	7.77E+00	mg/kg	7.77E+00	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.26E+01	mg/kg	1.26E+01	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	9.60E-01	mg/kg	9.60E-01	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	4.80E+00	mg/kg	4.80E+00	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arochlor 1248	1.08E+00	mg/kg	1.08E+00	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Arsenic	4.74E+00	mg/kg	4.74E+00	mg/kg	M	1.1E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	3.91E-03
	Lead	3.84E+02	mg/kg	3.84E+02	mg/kg	M	N/A	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	(total)												3.9E-03
												Total Hazard Index Across All Exposure Routes/Pathways	4.0E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 6-27
TOWN OF SALINA LANDFILL
CALCULATION OF NON-CANCER HAZARDS REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: On-Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Benzo(a)anthracene	8.6	mg/kg	8.6	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	11.7	mg/kg	11.7	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	22.2	mg/kg	22.2	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5	mg/kg	1.5	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	5.2	mg/kg	5.2	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Arochlor 1248	420	mg/kg	420	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Arsenic	20.80	mg/kg	20.80	mg/kg	M	4.7E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.6E-01
	Chromium	4265.00	mg/kg	4265.00	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Lead	417.90	mg/kg	417.90	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	(total)												1.6E-01
Dermal													
	Benzo(a)anthracene	8.6	mg/kg	8.6	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	11.7	mg/kg	11.7	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	22.2	mg/kg	22.2	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	1.5	mg/kg	1.5	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	5.2	mg/kg	5.2	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Arochlor 1248	420	mg/kg	420	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Arsenic	20.80	mg/kg	20.80	mg/kg	M	4.9E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	1.72E-02
	Chromium	4265.00	mg/kg	4265.00	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Lead	417.90	mg/kg	417.90	mg/kg	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	(total)												1.7E-02
Total Hazard Index Across All Exposure Routes/Pathways													1.7E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 6-28
TOWN OF SALINA LANDFILL
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: On-Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	1,1,1-Trichloroethane	0.0939	mg/l	0.0939	mg/l	M	1.8E-04	mg/kg-day	2.8E-01	mg/kg-day	N/A	N/A	6.3E-04
	1,1-Dichloroethene	0.0517	mg/l	0.0517	mg/l	M	9.7E-05	mg/kg-day	9.0E-03	mg/kg-day	N/A	N/A	1.1E-02
	1,2-Dichloroethene (total)	4.7	mg/l	4.7	mg/l	M	8.8E-03	mg/kg-day	9.0E-03	mg/kg-day	N/A	N/A	9.8E-01
	Trichloroethene	0.071	mg/l	0.071	mg/l	M	1.3E-04	mg/kg-day	6.0E-03	mg/kg-day	N/A	N/A	2.2E-02
	Vinyl Chloride	0.118	mg/l	0.118	mg/l	M	2.2E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	7.4E-02
	Benzene	0.015	mg/l	0.015	mg/l	M	2.8E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	9.4E-03
	Chloroethane	0.0295	mg/l	0.0295	mg/l	M	5.5E-05	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	1.4E-04
	Chloromethane	0.0187	mg/l	0.0187	mg/l	M	NA	N/A	N/A	N/A	N/A	N/A	N/A
	Toluene	1.59	mg/l	1.59	mg/l	M	3.0E-03	mg/kg-day	2.0E+00 (2)	mg/kg-day	N/A	N/A	1.5E-03
	Xylenes	1.58	mg/l	1.58	mg/l	M	3.0E-03	mg/kg-day	2.0E+00	mg/kg-day	N/A	N/A	1.5E-03
	1,4-Dichlorobenzene	0.009	mg/l	0.009	mg/l	M	NA	N/A	N/A	N/A	N/A	N/A	N/A
	Naphthalene	0.0122	mg/l	0.0122	mg/l	M	2.3E-05	mg/kg-day	2.0E-02 (2)	mg/kg-day	N/A	N/A	1.1E-03
	Aldrin	0.00001	mg/l	0.00001	mg/l	M	1.9E-08	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	6.3E-04
	Arochlor 1248	0.00157	mg/l	0.00157	mg/l	M	NA	N/A	N/A	N/A	N/A	N/A	N/A
	Arsenic	0.033	mg/l	0.033	mg/l	M	6.2E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.1E-01
	Cadmium	0.034	mg/l	0.034	mg/l	M	6.4E-05	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.3E-01
	Chromium	0.152	mg/l	0.152	mg/l	M	NA	N/A	N/A	N/A	N/A	N/A	N/A
	Lead	0.047	mg/l	0.047	mg/l	M	NA	N/A	N/A	N/A	N/A	N/A	N/A
	Manganese	2.950	mg/l	2.950	mg/l	M	5.5E-03	mg/kg-day	1.4E-01	mg/kg-day	N/A	N/A	4.0E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.5E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) subchronic RfD

TABLE 6-29
TOWN OF SALINA LANDFILL
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	4.32237E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.15533E-07
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	4.32237E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	3.15533E-06
	Benzo(b)fluoranthene	12.6	mg/kg	12.6	mg/kg	M	7.00925E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	5.11675E-07
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	5.34038E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	3.89848E-07
	Indeno(1,2,3-cd)pyrene	4.8	mg/kg	4.8	mg/kg	M	2.67019E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.94924E-07
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	6.00793E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.20159E-07
	Arsenic	4.74	mg/kg	4.74	mg/kg	M	2.63681E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	3.95522E-07
	Lead	383.6	mg/kg	383.6	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	(total)										5.08299E-06
Dermal											
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	3.94459E-06	mg/kg-day	1.83E+00	(mg/kg-day)$^{-1}$	7.19889E-06
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	5.12797E-06	mg/kg-day	1.83E+01	(mg/kg-day)$^{-1}$	9.35855E-05
	Benzo(b)fluoranthene	12.6	mg/kg	12.6	mg/kg	M	6.39664E-06	mg/kg-day	1.83E+00	(mg/kg-day)$^{-1}$	1.16739E-05
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	4.87363E-07	mg/kg-day	1.83E+01	(mg/kg-day)$^{-1}$	8.89438E-06
	Indeno(1,2,3-cd)pyrene	4.8	mg/kg	4.8	mg/kg	M	2.43682E-06	mg/kg-day	1.83E+00	(mg/kg-day)$^{-1}$	4.44719E-06
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	7.67597E-07	mg/kg-day	2.08E+00	(mg/kg-day)$^{-1}$	1.59916E-06
	Arsenic	4.74	mg/kg	4.74	mg/kg	M	7.21907E-07	mg/kg-day	1.58E+00	(mg/kg-day)$^{-1}$	1.13985E-06
	Lead	383.6	mg/kg	383.6	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	(total)										1.3E-04
										Total Risk Across All Exposure Routes/Pathways	1.3E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 6-30
TOWN OF SALINA LANDFILL
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	1.0948E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	7.992E-08
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	1.0948E-07	mg/kg-day	7.30E+00	(mg/kg-day)-1	7.992E-07
	Benzo(b)fluoranthene	12.6	mg/kg	12.6	mg/kg	M	1.7753E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	1.296E-07
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	1.3526E-08	mg/kg-day	7.30E+00	(mg/kg-day)-1	9.87429E-08
	Indeno(1,2,3-cd)pyrene	4.8	mg/kg	4.8	mg/kg	M	6.7632E-08	mg/kg-day	7.30E-01	(mg/kg-day)-1	4.93714E-08
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	1.5217E-08	mg/kg-day	2.00E+00	(mg/kg-day)-1	3.04344E-08
	Arsenic	4.74	mg/kg	4.74	mg/kg	M	6.6787E-08	mg/kg-day	1.50E+00	(mg/kg-day)-1	1.0018E-07
	Lead	383.6	mg/kg	383.6	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	(total)										1.28745E-06
Dermal											
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	3.6522E-07	mg/kg-day	1.83E+00	(mg/kg-day)-1	6.66533E-07
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	4.7479E-07	mg/kg-day	1.83E+01	(mg/kg-day)-1	8.66493E-06
	Benzo(b)fluoranthene	12.6	mg/kg	12.6	mg/kg	M	5.9225E-07	mg/kg-day	1.83E+00	(mg/kg-day)-1	1.08086E-06
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	4.5124E-08	mg/kg-day	1.83E+01	(mg/kg-day)-1	8.23515E-07
	Indeno(1,2,3-cd)pyrene	4.8	mg/kg	4.8	mg/kg	M	2.2562E-07	mg/kg-day	1.83E+00	(mg/kg-day)-1	4.11758E-07
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	7.1071E-08	mg/kg-day	2.08E+00	(mg/kg-day)-1	1.48064E-07
	Arsenic	4.74	mg/kg	4.74	mg/kg	M	6.684E-08	mg/kg-day	1.58E+00	(mg/kg-day)-1	1.05537E-07
	Lead	383.6	mg/kg	383.6	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	(total)										1.2E-05
										Total Risk Across All Exposure Routes/Pathways	1.3E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 6-31
TOWN OF SALINA LANDFILL
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Current/Future
Medium: Leachate
Exposure Medium: Leachate
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Benzene	0.0038	mg/l	0.0038	mg/l	M	1.05695E-07	mg/kg-day	5.50E-02	$(mg/kg\text{-}day)^{-1}$	5.81323E-09
	1,4-Dichlorobenzene	0.0022	mg/l	0.0022	mg/l	M	6.11919E-08	mg/kg-day	2.40E-02	$(mg/kg\text{-}day)^{-1}$	1.4686E-09
	Aroclor 1248	0.001	mg/l	0.001	mg/l	M	2.78145E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	5.5629E-08
	Chromium	0.126	mg/l	0.126	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Lead	0.199	mg/l	0.199	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Manganese	1	mg/l	1	mg/l	M	N/A	N/A	N/A	N/A	N/A
	(total)										6.29108E-08
Dermal											
	Benzene	0.0038	mg/l	0.0038	mg/l	M	1.429E-07	mg/kg-day	5.50E-02	$(mg/kg\text{-}day)^{-1}$	7.85948E-09
	1,4-Dichlorobenzene	0.0022	mg/l	0.0022	mg/l	M	3.59882E-07	mg/kg-day	6.00E-02	$(mg/kg\text{-}day)^{-1}$	2.15929E-08
	Aroclor 1248	0.001	mg/l	0.001	mg/l	M	8.83722E-07	mg/kg-day	2.08E+00	$(mg/kg\text{-}day)^{-1}$	1.84109E-06
	Chromium	0.126	mg/l	0.126	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Lead	0.199	mg/l	0.199	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Manganese	1	mg/l	1	mg/l	M	N/A	N/A	N/A	N/A	N/A
	(total)										1.9E-06
										Total Risk Across All Exposure Routes/Pathways	1.9E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 6-32
TOWN OF SALINA LANDFILL
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
(Page 1 of 1)

Scenario Timeframe: Current/Future
Medium: Leachate
Exposure Medium: Leachate
Exposure Point: On-Site
Receptor Population: Trespasser
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Benzene	0.0038	mg/l	0.0038	mg/l	M	5.3542E-08	mg/kg-day	5.50E-02	(mg/kg-day)-1	2.94481E-09
	1,4-Dichlorobenzene	0.0022	mg/l	0.0022	mg/l	M	3.0998E-08	mg/kg-day	2.40E-02	(mg/kg-day)-1	7.43953E-10
	Aroclor 1248	0.001	mg/l	0.001	mg/l	M	1.409E-08	mg/kg-day	2.00E+00	(mg/kg-day)-1	2.818E-08
	Chromium	0.126	mg/l	0.126	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Lead	0.199	mg/l	0.199	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Manganese	1	mg/l	1	mg/l	M	N/A	N/A	N/A	N/A	N/A
	(total)										3.18688E-08
Dermal											
	Benzene	0.0038	mg/l	0.0038	mg/l	M	1.1908E-07	mg/kg-day	5.50E-02	(mg/kg-day)-1	6.54927E-09
	1,4-Dichlorobenzene	0.0022	mg/l	0.0022	mg/l	M	2.9989E-07	mg/kg-day	6.00E-02	(mg/kg-day)-1	1.79932E-08
	Aroclor 1248	0.001	mg/l	0.001	mg/l	M	7.364E-07	mg/kg-day	2.08E+00	(mg/kg-day)-1	1.53417E-06
	Chromium	0.126	mg/l	0.126	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Lead	0.199	mg/l	0.199	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Manganese	1	mg/l	1	mg/l	M	N/A	N/A	N/A	N/A	N/A
	(total)										1.6E-06
										Total Risk Across All Exposure Routes/Pathways	1.6E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 6-33
TOWN OF SALINA LANDFILL
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: On-Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	5.0048E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	3.65349E-07
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	5.0048E-07	mg/kg-day	7.30E+00	(mg/kg-day)-1	3.65349E-06
	Benzo(b)fluoranthene	12.6	mg/kg	12.6	mg/kg	M	8.1159E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	5.92457E-07
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	6.1835E-08	mg/kg-day	7.30E+00	(mg/kg-day)-1	4.51396E-07
	Indeno(1,2,3-cd)pyrene	4.8	mg/kg	4.8	mg/kg	M	3.0918E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	2.25698E-07
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	6.9564E-08	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.39129E-07
	Arsenic	4.74	mg/kg	4.74	mg/kg	M	3.0531E-07	mg/kg-day	1.50E+00	(mg/kg-day)-1	4.57966E-07
	Lead	383.6	mg/kg	383.6	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	(total)										5.88548E-06
Dermal											
	Benzo(a)anthracene	7.77	mg/kg	7.77	mg/kg	M	1.7392E-07	mg/kg-day	1.83E+00	(mg/kg-day)-1	3.17397E-07
	Benzo(a)pyrene	7.77	mg/kg	7.77	mg/kg	M	2.2609E-07	mg/kg-day	1.83E+01	(mg/kg-day)-1	4.12616E-06
	Benzo(b)fluoranthene	12.6	mg/kg	12.6	mg/kg	M	2.8203E-07	mg/kg-day	1.83E+00	(mg/kg-day)-1	5.14697E-07
	Dibenz(a,h)anthracene	0.96	mg/kg	0.96	mg/kg	M	2.1488E-08	mg/kg-day	1.83E+01	(mg/kg-day)-1	3.9215E-07
	Indeno(1,2,3-cd)pyrene	4.8	mg/kg	4.8	mg/kg	M	1.0744E-07	mg/kg-day	1.83E+00	(mg/kg-day)-1	1.96075E-07
	Arochlor 1248	1.08	mg/kg	1.08	mg/kg	M	3.3843E-08	mg/kg-day	2.08E+00	(mg/kg-day)-1	7.05065E-08
	Arsenic	4.74	mg/kg	4.74	mg/kg	M	3.1829E-08	mg/kg-day	1.58E+00	(mg/kg-day)-1	5.02557E-08
	Lead	383.6	mg/kg	383.6	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	(total)										5.7E-06
										Total Risk Across All Exposure Routes/Pathways	1.2E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 6-34
TOWN OF SALINA LANDFILL
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: On-Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Benzo(a)anthracene	8.6	mg/kg	8.6	mg/kg	M	5.5394E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	4.04376E-07
	Benzo(a)pyrene	11.7	mg/kg	11.7	mg/kg	M	7.5361E-07	mg/kg-day	7.30E+00	(mg/kg-day)-1	5.50139E-06
	Benzo(b)fluoranthene	22.2	mg/kg	22.2	mg/kg	M	1.4299E-06	mg/kg-day	7.30E-01	(mg/kg-day)-1	1.04385E-06
	Dibenz(a,h)anthracene	1.5	mg/kg	1.5	mg/kg	M	9.6617E-08	mg/kg-day	7.30E+00	(mg/kg-day)-1	7.05306E-07
	Indeno(1,2,3-cd)pyrene	5.2	mg/kg	5.2	mg/kg	M	3.3494E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	2.44506E-07
	Arochlor 1248	420	mg/kg	420	mg/kg	M	2.7053E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	5.41057E-05
	Arsenic	20.8	mg/kg	20.8	mg/kg	M	1.3398E-06	mg/kg-day	1.50E+00	(mg/kg-day)-1	2.00964E-06
	Chromium	4265	mg/kg	4265	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	Lead	417.9	mg/kg	417.9	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	(total)										6.40147E-05
Dermal											
	Benzo(a)anthracene	8.6	mg/kg	8.6	mg/kg	M	1.9249E-07	mg/kg-day	1.83E+00	(mg/kg-day)-1	3.51301E-07
	Benzo(a)pyrene	11.7	mg/kg	11.7	mg/kg	M	3.4045E-07	mg/kg-day	1.83E+01	(mg/kg-day)-1	6.21313E-06
	Benzo(b)fluoranthene	22.2	mg/kg	22.2	mg/kg	M	4.969E-07	mg/kg-day	1.83E+00	(mg/kg-day)-1	9.06847E-07
	Dibenz(a,h)anthracene	1.5	mg/kg	1.5	mg/kg	M	3.3575E-08	mg/kg-day	1.83E+01	(mg/kg-day)-1	6.12735E-07
	Indeno(1,2,3-cd)pyrene	5.2	mg/kg	5.2	mg/kg	M	1.1639E-07	mg/kg-day	1.83E+00	(mg/kg-day)-1	2.12415E-07
	Arochlor 1248	420	mg/kg	420	mg/kg	M	1.3161E-05	mg/kg-day	2.08E+00	(mg/kg-day)-1	2.74192E-05
	Arsenic	20.8	mg/kg	20.8	mg/kg	M	1.3967E-07	mg/kg-day	1.58E+00	(mg/kg-day)-1	2.20531E-07
	Chromium	4265	mg/kg	4265	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	Lead	417.9	mg/kg	417.9	mg/kg	M	N/A	N/A	N/A	N/A	N/A
	(total)										3.6E-05
										Total Risk Across All Exposure Routes/Pathways	1.0E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

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TABLE 6-35
TOWN OF SALINA LANDFILL
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: On-Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	1,1,1-Trichloroethane	0.0939	mg/l	0.0939	mg/l	M	N/A	N/A	N/A	N/A	N/A
	1,1-Dichloroethene	0.0517	mg/l	0.0517	mg/l	M	2.78E-06	mg/kg-day	6.00E-01	$(mg/kg\text{-}day)^{-1}$	1.67E-06
	1,2-Dichloroethene (total)	4.7	mg/l	4.7	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Benzene	0.015	mg/l	0.015	mg/l	M	8.05E-07	mg/kg-day	5.50E-02	$(mg/kg\text{-}day)^{-1}$	4.43E-08
	Chloroethane	0.0295	mg/l	0.0295	mg/l	M	1.58E-06	mg/kg-day	2.90E-03	$(mg/kg\text{-}day)^{-1}$	4.59E-09
	Chloromethane	0.0187	mg/l	0.0187	mg/l	M	1.00E-06	mg/kg-day	1.30E-02	$(mg/kg\text{-}day)^{-1}$	1.30E-08
	Toluene	1.59	mg/l	1.59	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Trichloroethene	0.071	mg/l	0.071	mg/l	M	3.81E-06	mg/kg-day	1.10E-02	$(mg/kg\text{-}day)^{-1}$	4.19E-08
	Vinyl Chloride	0.118	mg/l	0.118	mg/l	M	6.33E-06	mg/kg-day	7.20E-01	$(mg/kg\text{-}day)^{-1}$	4.56E-06
	Xylenes	1.58	mg/l	1.58	mg/l	M	N/A	N/A	N/A	N/A	N/A
	1,4-Dichlorobenzene	0.009	mg/l	0.009	mg/l	M	4.83E-07	mg/kg-day	2.40E-02	$(mg/kg\text{-}day)^{-1}$	1.16E-08
	Naphthalene	0.0122	mg/l	0.0122	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Aldrin	0.00001	mg/l	0.00001	mg/l	M	5.37E-10	mg/kg-day	1.70E+01	$(mg/kg\text{-}day)^{-1}$	9.12E-09
	Arochlor 1248	0.00157	mg/l	0.00157	mg/l	M	8.43E-08	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	1.69E-07
	Arsenic	0.033	mg/l	0.033	mg/l	M	1.77E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	2.66E-06
	Cadmium	0.034	mg/l	0.034	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Chromium	0.152	mg/l	0.152	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Lead	0.0466	mg/l	0.0466	mg/l	M	N/A	N/A	N/A	N/A	N/A
	Manganese	2.95	mg/l	2.95	mg/l	M	N/A	N/A	N/A	N/A	N/A
										Total Risk Across All Exposure Routes/Pathways	9.2E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

The hazard quotients calculated for each COC and exposure pathway are presented in Tables 6-22 through 6-28. A hazard quotient of 0.1 or greater for a particular chemical indicates that there may be a concern of noncarcinogenic health effects occurring in humans as a result of exposure. The greater the value of the hazard quotient, the greater the level of concern; however, the hazard quotient should not be interpreted as a statistical probability of noncarcinogenic health effects occurring.

Individual hazard quotients were then summed for each pathway to obtain a hazard index for that pathway, as shown in Tables 6-22 through 6-28. The hazard indices provide an estimate of the aggregate risk that may be posed to humans as a result of exposure to more than one contaminant through a particular pathway. A hazard index greater than 0.1 indicates the potential for noncarcinogenic health effects for exposed populations. Any hazard quotient exceeding 0.1 for a particular exposure pathway will automatically result in a hazard index greater than 0.1 for that pathway; however, the sum of several hazard quotients of less than 0.1 may also result in a hazard index that exceeds 0.1. Tables 6-36, 6-37, and 6-38 provide risk assessment summary information for the three potential human health receptors at the site (i.e., child trespasser, adult trespasser, and construction worker).

The hazard quotients and indices for the current land use scenario do not exceed 0.1 for any of the exposure pathways evaluated (refer to Tables 6-36 and 6-37). The estimated hazard indices for the combined surface soil and leachate pathways were calculated as 0.026 (child trespasser) and 0.0048 (adult trespasser). Thus, risk of noncarcinogenic health effects was not identified under this site scenario. As the site conditions are assumed to be identical in the future, risks of noncarcinogenic health effects are also not anticipated for trespassers in the future land use scenario.

As shown in Table 6-38, the total hazard index for the construction worker in the future land use scenario was in exceedence of 0.1 (1.7). This value represents the cumulative effect of exposure to surface soil (ingestion and dermal contact), subsurface soil (ingestion and dermal contact), and groundwater (incidental ingestion only) at the site in the future. The groundwater route (HI = 1.48) represents the largest portion of the cumulative noncarcinogenic risk to construction workers. Thus, there appears to be a potential risk for noncancer health effects to this receptor in the future. The major COCs identified as contributing to the increased noncarcinogenic risk for construction workers were arsenic (for surface soil and subsurface soil), and arsenic, cadmium, and 1,2-dichloroethene (total) for groundwater.

TABLE 6-36
TOWN OF SALINA LANDFILL
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	On-Site	Benzo(a)anthracene	3.15E-07	N/A	7.20E-06	7.52E-06	Arsenic	skin	6.20E-03	N/A	1.77E-02	2.39E-02
			Benzo(a)pyrene	3.15E-06	N/A	9.36E-05	9.68E-05						
			Benzo(b)fluoranthene	5.12E-07	N/A	1.17E-05	1.22E-05						
			Dibenz(a,h)anthracene	3.90E-07	N/A	8.89E-06	9.28E-06						
			Indeno(1,2,3-cd)pyrene	1.95E-07	N/A	4.45E-06	4.65E-06						
			Arochlor 1248	1.20E-07	N/A	1.60E-06	1.72E-06						
			Arsenic	3.96E-07	N/A	1.14E-06	1.54E-06						
			(total)	5.08E-06		1.29E-04	1.3E-04	(total)		6.20E-03	N/A	1.77E-02	2.39E-02
Leachate	Leachate	On-site	Benzene	5.81E-09	N/A	7.86E-09	1.4E-08	Benzene	N/A	2.50E-04	N/A	3.33E-04	5.83E-04
			1,4-dichlorobenzene	1.47E-09	N/A	2.16E-08	2.31E-08	Manganese	CNS	1.40E-03	N/A	9.40E-05	1.49E-03
			Aroclor 1248	5.56E-08	N/A	1.84E-06	1.90E-06						
			(total)	6.29E-08		1.87E-06	1.9E-06	(total)		1.65E-03	N/A	4.27E-04	2.08E-03

Total Risk Across Surface Soil	1.3E-04
Total Risk Across Leachate	1.9E-06
Total Risk Across All Media and All Exposure Routes	1.4E-04

Total Hazard Index Across All Media and All Exposure Routes	2.60E-02
Total Skin HI =	2.39E-02
Total CNS HI =	1.49E-03

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TABLE 6-37
TOWN OF SALINA LANDFILL
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	On-Site	Benzo(a)anthracene	7.99E-08	N/A	6.67E-07	7.47E-07	Arsenic	skin	1.70E-03	N/A	1.82E-03	3.52E-03
			Benzo(a)pyrene	7.99E-07	N/A	8.66E-06	9.46E-06						
			Benzo(b)fluoranthene	1.30E-07	N/A	1.08E-06	1.21E-06						
			Dibenz(a,h)anthracene	9.87E-08	N/A	8.24E-07	9.23E-07						
			Indeno(1,2,3-cd)pyrene	4.94E-08	N/A	4.12E-07	4.61E-07						
			Arochlor 1248	3.04E-08	N/A	1.48E-07	1.78E-07						
			Arsenic	1.00E-07	N/A	1.05E-07	2.05E-07						
			(total)	1.29E-06		1.19E-05	1.3E-05	(total)		1.70E-03	N/A	1.82E-03	3.52E-03
Leachate	Leachate	On-site	Benzene	2.94E-09	N/A	6.55E-09	9.5E-09	Benzene	N/A	1.40E-04	N/A	3.09E-04	4.49E-04
			1,4-dichlorobenzene	7.44E-10	N/A	1.80E-08	1.87E-08	Manganese	CNS	7.80E-04	N/A	8.70E-05	8.67E-04
			Aroclor 1248	2.82E-08	N/A	1.53E-06	1.56E-06						
			(total)	3.19E-08		1.55E-06	1.6E-06	(total)		9.20E-04	N/A	3.96E-04	1.32E-03

Total Risk Across Surface Soil	1.3E-05
Total Risk Across Leachate	1.6E-06
Total Risk Across All Media and All Exposure Routes	1.5E-05

Total Hazard Index Across All Media and All Exposure Routes	4.84E-03
Total Skin HI =	3.52E-03
Total CNS HI =	8.67E-04

TABLE 6-38
TOWN OF SALINA LANDFILL
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	On-Site											
			Benzo(a)anthracene	3.65E-07	N/A	3.17E-07	6.82E-07	Arsenic	skin	3.60E-02	N/A	3.91E-03	3.99E-02
			Benzo(a)pyrene	3.65E-06	N/A	4.13E-06	7.78E-06						
			Benzo(b)fluoranthene	5.92E-07	N/A	5.15E-07	1.11E-06						
			Dibenz(a,h)anthracene	4.51E-07	N/A	3.92E-07	8.43E-07						
			Indeno(1,2,3-cd)pyrene	2.26E-07	N/A	1.96E-07	4.22E-07						
			Arochlor 1248	1.39E-07	N/A	7.05E-08	2.10E-07						
			Arsenic	4.58E-07	N/A	5.03E-08	5.08E-07						
			(total)	5.88E-06		5.67E-06	1.2E-05	(total)		3.60E-02	N/A	3.91E-03	3.99E-02
Subsurface Soil	Subsurface Soil	On-Site											
			Benzo(a)anthracene	4.04E-07	N/A	3.51E-07	7.6E-07	Arsenic	skin	1.60E-01	N/A	1.72E-02	1.77E-01
			Benzo(a)pyrene	5.50E-06	N/A	6.21E-06	1.2E-05						
			Benzo(b)fluoranthene	1.04E-06	N/A	9.07E-07	1.9E-06						
			Dibenz(a,h)anthracene	7.05E-07	N/A	6.13E-07	1.3E-06						
			Indeno(1,2,3-cd)pyrene	2.45E-07	N/A	2.12E-07	4.6E-07						
			Arochlor 1248	5.41E-05	N/A	2.74E-05	8.2E-05						
			Arsenic	2.01E-06	N/A	2.21E-07	2.2E-06						
			(total)	6.40E-05		3.59E-05	1.0E-04	(total)		1.60E-01	N/A	1.72E-02	1.77E-01
Groundwater	Groundwater	On-site											
			1,1-Dichloroethene	1.67E-06	N/A	N/A	1.7E-06	1,1,1-Trichloroethane	N/A	6.30E-04	N/A	N/A	6.30E-04
			Benzene	4.43E-08	N/A	N/A	4.4E-08	1,1-Dichloroethene	liver	1.10E-02	N/A	N/A	1.10E-02
			Chloroethane	4.59E-09	N/A	N/A	4.6E-09	1,2-Dichloroethene (tot)	liver	9.80E-01	N/A	N/A	9.80E-01
			Chloromethane	1.30E-08	N/A	N/A	1.3E-08	Trichloroethene	N/A	2.20E-02	N/A	N/A	2.20E-02
			Trichloroethene	4.19E-08	N/A	N/A	4.2E-08	Vinyl Chloride	liver	7.40E-02	N/A	N/A	7.40E-02
			Vinyl Chloride	4.56E-06	N/A	N/A	4.6E-06	Benzene	N/A	9.40E-03	N/A	N/A	9.40E-03
			1,4-Dichlorobenzene	1.16E-08	N/A	N/A	1.2E-08	Chloroethane	N/A	1.40E-04	N/A	N/A	1.40E-04
			Aldrin	9.12E-09	N/A	N/A	9.1E-09	Toluene	liver	1.50E-03	N/A	N/A	1.50E-03
			Arochlor 1248	1.69E-07	N/A	N/A	1.7E-07	Xylenes	liver	1.50E-03	N/A	N/A	1.50E-03
			Arsenic	2.66E-06	N/A	N/A	2.7E-06	Naphthalene	blood	1.10E-03	N/A	N/A	1.10E-03
								Aldrin	liver	6.30E-04	N/A	N/A	6.30E-04
								Arsenic	skin	2.10E-01	N/A	N/A	2.10E-01
								Cadmium	kidney	1.30E-01	N/A	N/A	1.30E-01
								Manganese	CNS	4.00E-02	N/A	N/A	4.00E-02
			(total)	9.18E-06	N/A	N/A	9.2E-06	(total)		1.48E+00	N/A	N/A	1.48E+00

Total Risk Across Surface Soil	1.2E-05
Total Risk Across Subsurface Soil	1.0E-04
Total Risk Across Groundwater	9.2E-06
Total Risk Across All Media and All Exposure Routes	1.2E-04

Total Hazard Index Across All Media and All Exposure Routes	1.70E+00

Total Skin HI =	4.27E-01
Total Liver HI=	1.07E+00
Total Kidney HI =	1.30E-01
Total Blood HI =	1.10E-03
Total CNS HI =	4.00E-02

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6.6.2 Carcinogenic Risk Estimate

Carcinogenic risk is estimated as the increased possibility of a receptor developing cancer over a lifetime as a result of exposure to a COC through one of the identified pathways. The carcinogenic slope factors, as identified in Table 6-21, are multiplied by the chronic daily intakes to obtain the incremental cancer risk to the receptor. The following equation is used to quantify carcinogenic health risks:

Cancer Risk = Chronic Daily Intake x Slope Factor

The calculated cancer risks for the COCs for each exposure pathway are presented in Tables 6-29 through 6-35. For this risk assessment, the acceptable range of cancer risk as a result of exposure to carcinogenic compounds is 1×10^{-4} to 1×10^{-6} (EPA).

Tables 6-36, 6-37, and 6-38 provide cancer risk assessment summary information for the three potential human health receptors at the site (i.e., child trespasser, adult trespasser, and construction worker). For the child trespasser receptor, the overall cancer risk (considering exposures to surface soil and leachate) in the current and future land use scenarios was 1.4×10^{-4}. This value exceeds EPA's acceptable cancer risk range, and, thus, elevated cancer risks to this population have been identified. The largest portion of this cumulative risk appears to be from dermal contact with surface soil (1.29×10^{-4}), as indicated in Table 6-36. The COCs contributing to the cancer risk for child trespassers are benzo(a)pyrene and benzo(b)fluoranthene for surface soil and Arochlor 1248 for leachate. As shown in Table 6-37, the total cancer risk for the adult trespasser was below 1×10^{-4} (i.e., within the acceptable range of risk).

The cumulative cancer risk for the construction worker in the future land use scenario (through exposures to surface soil, subsurface soil, and groundwater) was slightly higher than the acceptable range (1.2×10^{-4}). Thus, a cancer risk exists for this future receptor. The largest portion of the construction worker cancer risk appeared to be attributable to ingestion of and dermal contact with subsurface soil (combine medium cancer risk of 1.0×10^{-4}). Some of the COCs that appeared to contribute most significantly to the construction worker cancer risk were benzo(a)pyrene, benzo(b)fluoranthene, Aroclor 1248, and arsenic.

6.7 SUMMARY AND CONCLUSIONS

The human health risk assessment conducted for the Town of Salina site concluded that the COCs detected in environmental media at the site (i.e., PAHs, arsenic, Aroclor 1248) at the levels identified in the RI pose elevated noncarcinogenic and carcinogenic health risks to potentially exposed populations at the site.

6.7.1 Uncertainty

There are a number of sources of uncertainty in the quantification of the human health risk posed by the COCs present at the landfill. Uncertainty is introduced in the measurement of contaminant concentrations in site media, in the calculation of chemical intakes based on the exposure factor assumptions, and in the toxicity values used for evaluating health risks resulting from intakes of the chemicals at the levels estimated. These uncertainties are discussed below. The estimation of chemical intakes in the risk assessment process is based on the measured contaminant concentrations at the site. The exposure concentrations used in the chemical intake equations were the maximum detected contaminant concentrations in the media of concern (when less than ten samples in a data set), or the lower of the maximum concentration and the 95% UCL of the arithmetic mean. For some parameters in surface soil and groundwater (i.e., dibenzo(a,h)anthracene in surface soil; 1,4-Dichlorobenzene, aldrin, and cadmium in groundwater), the maximum concentration was lower than the calculated 95% UCL value and was, thus, used in the calculations. However, it should be noted that this may indicate that the true average concentration for the parameters may be greater than the maximum observed concentrations.

The exposure factors (i.e., ingestion rates, exposure durations, exposure frequencies) used in this risk assessment were based on currently available guidance. Some of these factors are based on limited data; therefore, their use introduces uncertainty into the calculation of chemical intakes. Those factors for which guidance values were not available were estimated based on professional judgement and knowledge of site conditions. Development of site-specific exposure factors also introduces uncertainty in the risk assessment process.

The slope factors developed by EPA are generally conservative and are intended to represent an upper-bound limit of the probability of a cancer response. Thus, the actual risk of cancer due to exposure to the COCs is likely to be lower than the estimated risk. The RfDs are also conservative and are generally considered to have an uncertainty of an order of magnitude or more. It should also be noted that for some parameters (e.g., lead) no or limited toxicity information exists and quantitative analyses could not be performed.

7.0 ECOLOGICAL RISK ASSESSMENT

The purpose of an ecological risk assessment at an Inactive Hazardous Waste Site is to gather information on potential adverse effects to ecological receptors from exposure to contaminants at a site. This information is used to assist in formulating remedial decisions for the site. The original objective of this ecological risk assessment for the Town of Salina Landfill was to determine whether contaminants from the landfill are adversely affecting ecological organisms that utilize the aquatic and terrestrial habitats on and adjacent to the site. However, because the Town of Salina Landfill is also designated as a sub-site to the Onondaga Lake National Priority List Site, DEC and EPA determined that the ecological risks to organisms inhabiting and utilizing Ley Creek adjacent to the site would not be evaluated in this project. This decision was contingent on DEC's and EPA's decision that all sources of contaminants from the site to Ley Creek (i.e., surface runoff, leachate, groundwater, etc.) be addressed in the Remedial Investigation for the site. The Town of Salina was notified of this decision via a letter from DEC to the Town of Salina, dated March 3, 2000. Therefore, only the risks associated with the on-site environment at the Town of Salina Landfill are evaluated in this ecological risk assessment.

This ecological risk assessment was conducted according to both NYSDEC guidance and guidance from the U.S. Environmental Protection Agency (EPA). The specific guidance documents used included: (1) NYSDEC's Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (FWIA) dated October 1994 (NYSDEC 1994); (2) NYSDEC's Generic Ecological Risk Assessment Guidance for Onondaga Lake Sites dated 7 April 1998 (NYSDEC 1998b), and (3) the U.S. Environmental Protection Agency (EPA) Ecological Risk Assessment Guidance for Superfund (ERAGS): Process for Designing and Conducting Ecological Risk Assessments, dated June 5, 1997 (USEPA 1997).

7.1 SCREENING LEVEL RISK ASSESSMENT

7.1.1 Applicable Standards, Criteria, and Guidance Values

Contaminant data for leachate, surface water, sediment, and surface soil were compared with applicable or relevant and appropriate requirements (ARARs), and with standards, criteria, and guidance values (SCGs) on levels of contaminants that are considered to be "safe" for ecological receptors. A preliminary evaluation of potential exposure pathways indicated very little potential for ecological receptors of concern to be exposed to contaminants directly via groundwater or subsurface soil (see Section 7.2). Therefore, these pathways were not evaluated in this risk assessment. NYSDEC's standards and guidance values for surface water were used to assess the quality of surface water and leachate (NYSDEC 1998c). EPA's ambient water quality criteria (USEPA 1999a) intended for the protection of aquatic organisms were also used to supplement the NYSDEC standards. For sediments, the NYSDEC Technical Guidance for Screening Contaminated Sediments was used as the primary source of screening values for sediment (NYSDEC 1999). Other commonly used screening values (Jones et al. 1997; Persaud et al. 1993; Long et al. 1995; Long and Morgan 1990) were also used to supplement the NYSDEC screening values. For soils, there are no promulgated criteria providing acceptable threshold contaminant concentrations for the protection of terrestrial organisms. However, screening values have been compiled for soil and litter invertebrates and terrestrial plants by the U.S. Department of Energy, Office of Environmental Management (Efroymson et al. 1997a, 1997b). These screening values are widely used for screening level evaluations of contaminants in soil and were therefore used for the screening level risk assessment for the Town of Salina Landfill. In addition, the U.S. EPA Region III has developed a compilation of soil screening values (USEPA 1995), and these values were also used to supplement the Efroymson et al. (1997a, 1997b) values. The ARARs, SCGs, and screening values identified above will all be referred to as "screening values" for the remainder of this Section.

7.1.1.1 Surface Water Screening Values

NYSDEC ambient water quality standards and guidance values were used to evaluate contamination of surface water and leachate (Table 7-1). Standards and guidance values have been developed by NYSDEC for specific classes of fresh and saline surface waters for the protection of the best uses assigned to each class. Ley Creek in the vicinity of the Town of Salina Landfill is designated as Class B waterbody. NYSDEC provides the following definition of best usage for Class B waters: "The best usage of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival."

EPA ambient water quality criteria were also used to supplement the NYSDEC ambient water quality criteria and guidance values (Table 7-1). As these guidelines are intended for the protection of all aquatic life (including vegetation), they are appropriate for the purposes of this ecological risk screening. The EPA acute criteria is the threshold value for which the 1-hr average concentration of a given chemical in freshwater should not be exceeded more than once every three years (on average). The EPA chronic criteria represents the four-day average concentration that should not be exceeded more than once every three years (on average).

TABLE 7-1
TOWN OF SALINA LANDFILL
SURFACE WATER AND LEACHATE SCREENING VALUES FOR THE ECOLOGICAL RISK ASSESSMENT

ANALYTE	NYSDEC TOGS 1.1.1 (1)							EPA Water Quality Criteria (2)	
	Standard				Guidance Value				
	H(FC)	A(C)	A(A)	W	H(FC)	A(C)	A(A)	Acute	Chronic
VOCs (ug/L)									
Benzene	10	---	---	---	---	210	760	---	---
Chlorobenzene	400	5	---	---	---	---	---	---	---
SVOCs (ug/L)									
Benzo(k)fluoranthene	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	5 (3)	---	---	---	---	---	---	---
PESTICIDES/PCBs (ug/L)									
Aroclor-1248	0.000001 (4)	---	---	0.00012 (4)	---	---	---	---	0.014 (4)
INORGANICS (ug/L)									
Aluminum	---	100 (5)	---	---	---	---	---	750 (6)	87 (6)
Barium	---	---	---	---	---	---	---	---	---
Calcium	---	---	---	---	---	---	---	---	---
Chromium	---	147 (7)	1127 (8)	---	---	---	---	16 (9)	11 (9)
Cobalt	---	5	---	---	---	---	---	---	---
Copper	---	18.2 (10)	29.5 (11)	---	---	---	---	29.5 (12)	18.2 (12)
Iron	---	300	---	---	---	---	---	---	1000
Lead	---	9.25 (13)	237 (14)	---	---	---	---	158 (12)	6.2 (12)
Magnesium	---	---	---	---	---	---	---	---	---
Manganese	---	---	---	---	---	---	---	---	---
Nickel	---	105 (15)	947 (16)	---	---	---	---	947 (12)	105 (12)
Potassium	---	---	---	---	---	---	---	---	---
Silver	---	0.1 (17)	---	---	---	---	---	14.45 (12)	---
Sodium	---	---	---	---	---	---	---	---	---
Vanadium	---	14 (18)	---	---	---	---	---	---	---
Zinc	---	168 (19)	237 (20)	---	---	---	---	237 (12)	239 (12)
Cyanide	9000	5.2 (21)	22 (21)	---	---	---	---	22 (21)	5.2 (21)

(1) NYSDEC Water Quality Standards (NYSDEC 1998c). Values listed are for Class B Waters.
(2) USEPA (1999a).
(3) Screening value applies to the sum of 1,2-, 1,3-, and 1,4-dichlorobenzene.
(4) Screening value is for total PCBs (Aroclor not specified).
(5) Screening value is for the ionic form.
(6) Screening value is for total recoverable metal in the water column.
(7) Calculated using the following equation: (0.86) exp(0.819[ln(ppm hardness)] + 0.6848). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form and does not include hexavalent chromium.
(8) Calculated using the following equation: (0.316) exp(0.819[ln(ppm hardness)] + 3.7256). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form and does not include hexavalent chromium.
(9) The more conservative screening value is for chromium VI was selected. Screening value is for the dissolved form.
(10) Calculated using the following equation: (0.96) exp(0.8545[ln(ppm hardness)] - 1.702). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form.
(11) Calculated using the following equation: (0.96) exp(0.9422[ln(ppm hardness)] - 1.7). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form.
(12) Hardness-dependent screening value. An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value is for the dissolved form.
(13) Calculated using the following equation: (1.46203 - [ln (hardness) (0.145712)]) exp (1.273 [ln (hardness)] - 4.297). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form.
(14) Calculated using the following equation: (1.46203 - [ln (hardness) (0.145712)]) exp (1.273 [ln (hardness)] - 1.052). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form.
(15) Calculated using the following equation: (0.997 exp(0.846[ln(hardness)] + 0.0584). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form.
(16) Calculated using the following equation: (0.998 exp(0.846[ln(hardness)] + 2.255). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form.
(17) Value is for ionic silver.
(18) Screening value is for the acid soluble form.
(19) Calculated using the following equation: exp(0.85[ln(ppm hardness)] + 0.50). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form.
(20) Calculated using the following equation: (0.978 exp(0.8473[ln(ppm hardness)] + 0.884). An average surface water hardness of 230 mg/L calculated for Ley Creek was assumed for this calculation. Screening value applies to the dissolved form.
(21) Screening value is for free cyanide.

Some of the NYSDEC and EPA water quality screening values are dependent on hardness. An average surface water hardness of 230 mg/L $CaCO_3$ (calcium carbonate), which was calculated from samples collected from Ley Creek, was assumed in order to estimate the appropriate site-specific screening value.

7.1.1.2 Sediment Screening Values

In November 1993, NYSDEC's Division of Fish and Wildlife adopted a technical guidance manual for the screening of contaminated sediment. This document was subsequently revised in March 1998 and January 1999 (NYSDEC 1999). The document provides sediment criteria for bioaccumulation and acute and chronic toxicity to benthic aquatic life in freshwater and marine systems (Table 7-2). The NYSDEC sediment criteria for non-polar organic compounds are provided as micrograms of contaminant per gram of organic carbon in sediment. Therefore, these values had to be normalized to the total organic carbon (TOC) content of the sediments being evaluated. For example, if a sediment contains 3% organic carbon, the site-specific sediment criteria for PCBs is derived as follows:

PCB criteria_{site} = PCB $\text{criteria}_{oc} \cdot f_{oc}$
f_{oc} = 3% OC/kg sediment = 30 gOC/kg
PCB criteria_{site} = 1.4 µg/g OC · 30 g OC/kg = 42 µg PCB/kg sediment

where:

PCB criteria_{site} = Site-specific PCB criteria
PCB criteria_{oc} = PCB criteria (in micrograms of contaminant per gram organic carbon)
f_{oc} = fraction of organic carbon in sediment (site-specific)
OC = organic carbon

This criterion implies that if there are less than 42 µg PCB/kg in sediment containing $\geq$ 3% organic carbon, there is no appreciable risk to aquatic wildlife from PCB concentrations in the sediment. To derive site-specific organic contaminant screening values for sediments at the Town of Salina Landfill, the NYSDEC criteria were normalized to the average measured TOC content (2,151 mg/kg) in Ley Creek sediments. Generally, an exceedance of organic carbon-normalized sediment criteria by a factor of 50 indicates that sediments will likely be acutely toxic, while chronic impacts are likely if the criteria are exceeded by a factor of 5 (NYSDEC 1999).

TABLE 7-2
TOWN OF SALINA LANDFILL
SEDIMENT SCREENING VALUES FOR THE ECOLOGICAL RISK ASSESSMENT

ANALYTE	NYSDEC (1999) (1)			Jones et al. (1997)	Persaud et al. (1993)		Long et al. (1995) or Long and Morgan (1990)	
	Acute	Chronic	Bioaccum.	EqP (1)	LEL	SEL (1)	ER-L	ER-M
VOCs (ug/kg)								
Acetone	---	---	---	1.9	---	---	---	---
Methylene chloride	---	---	---	79.6	---	---	---	---
Xylene (total)	590	65	---	34.4	---	---	---	---
SVOCs (ug/kg)								
2,4-Dinitrophenol	---	---	---	---	---	---	---	---
2,4-Dinitrotoluene	---	---	---	---	---	---	---	---
Acenaphthene	---	280 (2)	---	280	---	---	16	500
Acenaphthylene	---	---	---	---	---	---	44	640
Anthracene	35	3.8	---	47.3	220	796	85.3	1100
Benzo(a)anthracene	0.23	0.03	---	23.7	320	3183	261	1600
Benzo(a)pyrene	---	---	---	30.1	370	3097	430	1600
Benzo(b)fluoranthene	---	---	---	---	---	---	---	---
Benzo(g,h,i)perylene	---	---	---	---	170	688	---	---
Benzo(k)fluoranthene	---	---	---	---	240	2882	---	---
bis(2-Ethylhexyl)phthalate	---	429	---	191439	---	---	---	---
Carbazole	---	---	---	---	---	---	---	---
Chrysene	---	---	---	---	340	989	384	2800
Dibenzo(a,h)anthracene	---	---	---	---	60	280	63.4	260
Dibenzofuran	---	---	---	90.3	---	---	---	---
Di-n-butyl phthalate	---	---	---	2366	---	---	---	---
Fluoranthene	---	1334 (2)	---	1334	750	2194	600	5100
Fluorene	4.8	0.54	---	116.2	190	344	19	540
Indeno(1,2,3-cd)pyrene	---	---	---	---	200	688	---	---
Phenanthrene	---	387 (2)	---	387.2	560	2043	240	1500
Pyrene	42	4.6	---	---	490	1828	665	2600
PESTICIDES/PCBs (ug/kg)								
Aroclor-1248	5938 (6)	41.5 (6)	3.0 (6)	215.1	30.0	323	---	---
Aroclor-1260	5938 (6)	41.5 (6)	3.0 (6)	967950	5.0	51.6	---	---
INORGANICS (mg/kg)	Lowest Effect Level		Severe Effect Level	EqP	LEL	SEL	ER-L	ER-M
Aluminum	---		---	---	---	---	---	---
Arsenic	8.2		70	---	6.0	33.0	8.2	70.0
Barium	---		---	---	---	---	---	---
Beryllium	---		---	---	---	---	---	---
Cadmium	1.2		9.6	---	0.6	10.0	1.2	9.6
Calcium	---		---	---	---	---	---	---
Chromium	81		370	---	26.0	110	81.0	370
Cobalt	---		---	---	---	---	---	---
Copper	34		270	---	16.0	110	34.0	270
Iron	20000		40000	---	20000	40000	---	---
Lead	46.7		218	---	31	250	46.7	218
Magnesium	---		---	---	---	---	---	---
Manganese	460		1100	---	460	1100	---	---
Mercury	0.15		0.71	---	0.2	2.0	0.2	0.7
Nickel	20.9		51.6	---	16.0	75.0	20.9	51.6
Potassium	---		---	---	---	---	---	---
Selenium	---		---	---	---	---	---	---
Silver	1		3.7	---	---	---	1.0	3.7
Sodium	---		---	---	---	---	---	---
Thallium	---		---	---	---	---	---	---
Vanadium	---		---	---	---	---	---	---
Zinc	150		410	---	120	820	150	410
Cyanide	---		---	---	---	---	---	---

(1) Sediment screening values for organics were calculated based on the average sediment TOC content for Ley Creek of 2,151 mg/kg.
(2) The NYSDEC Sediment Criteria document lists a different proposed EPA sediment quality criteria. The chronic sediment quality criteria indicated in this table reflects revised proposed EPA criteria, as provided in the Jan. 18, 1994 Federal Register.
(3) Screening value is for "total chlorinated phenols."
(4) Screening value is for "dichlorobenzenes".
(5) See screening value for "phenols, total unchlorinated."
(6) Screening value is for "PCBs" (Aroclor not specified).

The NYSDEC sediment criteria for metals are based on sediment contaminant screening values developed by Persaud et al. (1993) and Long and Morgan (1990). Screening values developed by Persaud et al. (1993) are provided as Lowest Effect Levels (LELs) and Severe Effect Levels (SELs), while those developed by Long and Morgan (1990) are presented as Effect Range-Low (ER-L) and Effect Range-Median (ER-M) values. For any contaminant for which a screening value had been developed by both Persaud et al. (1993) and Long and Morgan (1990), the most conservative (i.e., lowest) value was selected as the NYSDEC screening value.

According to Persaud et al. (1993), an LEL is intended to represent a level of sediment contamination that can be tolerated by the majority of benthic organisms. At the LEL, the sediment is considered to be clean to marginally polluted. An SEL, on the other hand, represents a level at which pronounced disturbance of the sediment-dwelling community can be expected. At or above an SEL, the sediment is considered heavily polluted and likely to affect the health of sediment-dwelling organisms. If only the lowest criterion (i.e., LEL) is exceeded, the potential or effect is considered moderate. If both criteria are exceeded, the sediment is considered to be severely impacted. The LEL values compare closely with the ER-L values provided in Long and Morgan (1990) and Long et al. (1995). To derive ER-L and ER-M values, Long and Morgan (1990) and Long et al. (1995) assembled, evaluated, and collated all available information in which adverse biological effects and chemical concentrations in sediments were reported. The ER-L is the lower 10^{th} percentile of the effects data distribution for a contaminant, and the ER-M is the 50^{th} percentile of the effects data distribution. The ER-L represents a concentration above which adverse effects may begin or are predicted among sensitive life stages and/or species, and an ER-M value is the concentration above which effects are frequently or always observed or predicted among most species.

Subsequent to the initial publication of NYSDEC's technical guidance manual, the Long and Morgan (1990) screening values were updated for some contaminants (Long et al. 1995). The January 1999 revision to NYSDEC's technical guidance incorporates these updated values, but states that they should only be used for marine and estuarine sediments. However, the Long and Morgan (1990) values were also originally intended only for marine and estuarine sediments, but the NYSDEC guidance indicates that these values for metals be used for all sediments, regardless of whether they are freshwater or marine. To remain consistent with the most current information on sediment screening values, the Long et al. (1995) values were used for those contaminants whose screening values were updated, even though Ley Creek is a freshwater waterbody. The Persaud et al. (1993) values, the Long and Morgan (1990) or Long et al. (1995) values, and the NYSDEC (1999) values are listed in Table 7-2.

Persaud et al. (1993), Long and Morgan (1990), and Long et al. (1995) also developed screening values for organic contaminants in sediment. These organic screening values are also listed in Table 7-2 and were used as additional screening values to supplement the NYSDEC screening values for organics in sediment.

The sources for sediment screening values discussed thus far (NYSDEC 1999; Persaud et al. 1993; Long and Morgan 1990; Long et al. 1995) provide sediment screening values for only a limited number of contaminants. Jones et al. (1997) developed sediment screening values for additional non-ionic organic contaminants using a method called the Equilibrium Partitioning (EqP) Approach. This approach calculates a bulk sediment chemical concentration (screening value) using a water quality criterion and a correction factor for the effects of organic carbon. Screening values derived using the EqP approach are expressed as mass of contaminant per mass of organic carbon in the sediment. These screening values, therefore, must also be adjusted for the organic carbon content of the sediments at the site, similar to the NYSDEC screening values discussed above. Again, the measured average organic carbon concentration (2,151 mg/kg) in sediment collected from Ley Creek was used to make this conversion. The resulting EqP screening values are listed in Table 7-2.

7.1.1.3 Soil Screening Values

Screening values for surface soil contaminants were primarily obtained from compilations of screening values derived for the U.S. Department of Energy, Oak Ridge National Laboratory in Oak Ridge, Tennessee. These values were derived for toxicity to three types of organisms: terrestrial invertebrates (earthworms), soil microorganisms, and terrestrial plants (Efroymson et al. 1997a, 1997b). In order to derive the screening values, the authors compiled toxicity test data for each of the three types of organisms (earthworms, microorganisms, and plants), rank-ordered the lowest observed effect concentration (LOEC) values from the resulting data sets for each organism type, and approximated the lower 10^{th} percentile of the distribution of these values. If the 10^{th} percentile fell between LOEC values, a value was chosen by interpolation. The resulting screening values are intended to be conservative values that can be used in a screening level ecological risk assessment.

The Efroymson et al. (1997a, 1997b) documents provide soil screening values for only a limited number of contaminants. For those contaminants for which no screening value was provided in these documents, U.S. EPA Region III screening values for soil (USEPA 1995) were used to supplement the Efroymson et al. (1997a, 1997b) values. All of the soil screening values used for this ecological risk assessment are listed in Table 7-3.

7.1.2 Identification of Contaminants of Potential Concern (COPCs)

Previous studies conducted at the landfill have identified several contaminants that have exceeded standards and guidance values. The contaminants identified in Table 7-4 were above standards or guidance values as reported in the Registry Site Classification Decision (Ecology and Environment 1994, 1996). Sampling conducted by NYSDEC in Ley Creek and the old Ley Creek channel during 1996 and 1997 also indicated elevated levels of PCBs and SVOCs (Section 1.2.3).

For this ecological risk assessment, data from samples collected in August 1998 and September 1999 for the RI were used. Contaminants of potential concern (COPCs) were identified from this data by comparing detected contaminant concentrations in leachate, surface water, sediment, and surface soil samples with the applicable criteria, guidelines, and screening values identified above. As discussed, more than one screening value, if available, was used for each contaminant in each media. The use of a variety of screening values provides an indication of the type of potential effects (e.g., acute or chronic) expected to result from a given concentration of a compound.

The analytical results for leachate, surface water, sediment, and surface soil are provided in Tables 4-4, 4-5, 4-6, and 4-7. Summary statistics were calculated from the analytical results to assist in the ecological risk screening and identification of contaminants of potential concern (COPCs). These summary statistics include the number of detections, number of samples analyzed, the detection frequency, and the minimum and maximum contaminant concentrations. Mean contaminant concentrations are also provided for those media that were used beyond the screening level. A description of the methods used to calculate mean concentrations is provided in Section 7.4.1. Soil samples SS-40 and SS-41 and surface water and sediment samples collected at location 20 were not included in the analysis as these samples were collected off-site or upstream of the landfill and were intended to represent "background" contaminant concentrations. Although sediment sampling was attempted at two depths (6 and 12 in) it was difficult to maintain separation of these two depths during sampling. Therefore, both samples were treated as distinct surface sediment samples for the screening-level risk assessment. The summary statistics for surface water, leachate, sediment, and surface soil are provided in Tables 7-5, 7-6, 7-7, and 7-8, respectively.

TABLE 7-3
TOWN OF SALINA LANDFILL
SOIL SCREENING VALUES FOR THE ECOLOGICAL RISK ASSESSMENT

ANALYTE	Efroymson et al. (1997a)		Efroymson et al. (1997b)	U.S. EPA Region III Screening Criteria (1)	
	Toxicity to Earthworms	Toxicity to Microorgansims	Phytotoxicity	Fauna	Flora
VOCs (ug/kg)					
Bromoform	---	---	---	---	---
Methylene chloride	---	---	---	300 (2)	300 (2)
SVOCs (ug/kg)					
1,4-Dichlorobenzene	20,000	---	---	100 (2)	100 (2)
2-Methylnaphthalene	---	---	---	---	---
4-Chloroaniline	---	---	---	---	---
Acenaphthene	---	---	20,000	100	100
Acenaphthylene	---	---	---	100	100
Anthracene	---	---	---	100	100
Benzo(a)anthracene	---	---	---	100	100
Benzo(a)pyrene	---	---	---	100	100
Benzo(b)fluoranthene	---	---	---	100	100
Benzo(g,h,i)perylene	---	---	---	100	100
Benzo(k)fluoranthene	---	---	---	100	100
bis(2-Ethylhexyl)phthalate	---	---	---	---	---
Carbazole	---	---	---	---	---
Chrysene	---	---	---	100	100
Dibenzo(a,h)anthracene	---	---	---	100	100
Dibenzofuran	---	---	---	---	---
Fluoranthene	---	---	---	100	100
Fluorene	30,000	---	---	100	100
Hexachlorobenzene	---	1,000,000	---	---	---
Indeno(1,2,3-cd)pyrene	---	---	---	100	100
Napthalene	---	---	---	100	100
Phenanthrene	---	---	---	100	100
Pyrene	---	---	---	100	100
PESTICIDES/PCBs (ug/kg)					
4,4'-DDD	---	---	---	100 (2)	100 (2)
4,4'-DDE	---	---	---	100 (2)	100 (2)
4,4'-DDT	---	---	---	100 (2)	100 (2)
Aldrin	---	---	---	100 (2)	100 (2)
alpha-Chlordane	---	---	---	100 (2)(3)	100 (2)(3)
beta-BHC	---	---	---	---	---
delta-BHC	---	---	---	---	---
gamma-BHC (Lindane)	---	---	---	100 (2)	100 (2)
Dieldrin	---	---	---	100 (2)	100 (2)
Endrin aldehyde	---	---	---	100 (2)(4)	100 (2)(4)
Endrin ketone	---	---	---	100 (2)(4)	100 (2)(4)
gamma-Chlordane	---	---	---	100 (2)(3)	100 (2)(3)
Methoxychlor	---	---	---	100 (2)	100 (2)
Aroclor-1248	---	---	40,000 (5)	100 (5)	---
INORGANICS (mg/kg)					
Aluminum	---	600	50	---	1.0
Arsenic	60	100	10	---	328
Barium	---	3000	500	440	---
Beryllium	---	---	10	---	0.02
Cadmium	20	20	4	---	2.5
Calcium	---	---	---	---	---
Chromium	0.4	10	1	0.0075	0.02
Cobalt	---	1000	20	200	100
Copper	50	100	100	---	15
Iron	---	200	---	12	3260
Lead	500	900	50	0.01	2.0
Magnesium	---	---	---	4400	4400
Manganese	---	100	500	330	300
Mercury	0.1	30	0.3	0.058	0.058
Nickel	200	90	30	---	2.0
Potassium	---	---	---	---	---
Selenium	70	100	1	1.8	1.8
Silver	---	50	2	---	0.0000098
Sodium	---	---	---	---	---
Thallium	---	---	1	---	0.001
Vanadium	---	20	2	58	0.5
Zinc	200	100	50	---	10
Cyanide	---	---	---	0.005 (6)	---

(1) USEPA (1995).
(2) Screening value is actually listed as less than ("<") the value indicated in this table.
(3) Value is for chlordane.
(4) Value is for endrin.
(5) Value is for PCBs.
(6) Screening value is actually listed as greater than (">") the value indicated in this table.

TABLE 7-4
TOWN OF SALINA LANDFILL
CONTAMINANTS FOUND TO EXCEED GUIDANCE VALUES PRIOR TO THE PRESENT STUDY

PARAMETER	GUIDANCE VALUE (1)	RANGE OF VALUES
Surface Water From Ley Creek (Class B Standards)		
Aluminum	100 µg/L	150 - 607 µg/L
Iron	300 µg/L	372 - 1660 µg/L
Zinc	30 µg/L	37.6 - 77.1 µg/L
Surface Water from Drainageways (Class D Standards)		
Copper	123 µg/L, based on hardness	139 µg/L
Iron	300 µg/L	421 - 244,000 µg/L
Cyanide	22 µg/L	28 µg/L
Leachate (Class D Standards)		
PCB	0.001µg/L	2.5 and 2.6 µg/L
Copper	127 µg/L based on hardness	168 µg/L
Iron	300 µg/L	72,700 and 153,000 µg/L
Groundwater (Class GA Standards)		
Chloroethane	5 µg/L	360 µg/L
Total 1,2-dichloroethene	5 µg/L	64 µg/L
Trichloroethene	5 µg/L	14 µg/L
Benzene	1 µg/L	4-5 µg/L
Chlorobenzene	5 µg/L	10 µg/L
Total xylenes	5 µg/L	7-26 µg/L
Phenol	1 µg/L	4 µg/L
2-Methylphenol	1 µg/L	12 µg/L
4-Methylphenol	1 µg/L	3 µg/L
PCBs	0.09 µg/L	1.1 µg/L
Filtered Samples		
Antimony	3 µg/L	53.9 µg/L
Barium	1000 µg/L	1,100 µg/L
Iron	300 µg/L	24,400 - 64,500 µg/L
Magnesium	35,000 µg/L	37,200 - 72,100 µg/L
Manganese	300 µg/L	356-780 µg/L
Sodium	20,000 µg/L	23,400 - 366,000 µg/L
Subsurface Soil		
PCBs	---	630 - 2,700 µg/kg
Sediment from Ley Creek		
PCBs	---	570 - 2,200 µg/kg
Sediment from Drainageways		
PCBs	---	370 - 7,100 µg/kg

(1) TOGS 1.1.1 Standard guidance values for groundwater, surface water, and leachate.

TABLE 7-5
TOWN OF SALINA LANDFILL
SURFACE WATER SUMMARY STATISTICS FOR THE ECOLOGICAL RISK ASSESSMENT

ANALYTE	Number of Times Detected	Total Number of Samples	Detection Frequency	Minimum Concentration	Maximum Concentration	Mean Concentration
SVOCs (ug/L)						
Benzo(k)fluoranthene	2	5	40%	10 (1)	10	6.89
Total PAHs	2	5	40%	10 (1)	10	6.89
PEST/PCBs (ug/L)						
Aroclor-1248	2	5	40%	0.095 (1)	0.14	0.33
INORGANICS (ug/L)						
Aluminum	5	5	100%	136.56	237.65	193.57
Barium	5	5	100%	50.18	77.83	68.12
Calcium	5	5	100%	40240	94166	77053.40
Chromium	1	5	20%	2.29 (1)	2.29	1.18
Copper	5	5	100%	6.44	12.71	8.43
Iron	5	5	100%	444.39	701.59	569.41
Lead	5	5	100%	2.07	5.56	3.77
Magnesium	5	5	100%	8358.5	16045	12953.10
Manganese	5	5	100%	80.21	217.25	123.62
Nickel	4	5	80%	2.36 (1)	2.96	2.36
Potassium	5	5	100%	3664.9	4096	3851.30
Sodium	5	5	100%	50466	85413	71100.20
Vanadium	3	5	60%	1.49 (1)	1.79	1.23
Zinc	5	5	100%	18.95	53.1	29.80
Cyanide	3	5	60%	13.6 (1)	18.6	11.16

(1) Minimum value was actually non-detect. Value shown is the minimum of the samples in which the contaminant was detected.

TABLE 7-6
TOWN OF SALINA LANDFILL
SUMMARY STATISTICS FOR LEACHATE FOR THE ECOLOGICAL RISK ASSESSMENT

ANALYTE	Number of Times Detected	Total Number of Samples	Detection Frequency	Minimum Concentration		Maximum Concentration
VOCs (ug/L)						
Benzene	1	3	33%	3.80	(1)	3.80
Chlorobenzene	2	3	67%	10.30	(1)	22.00
SVOCs (ug/L)						
1,4 Dichlorobenzene	2	3	67%	2.00	(1)	2.20
PEST/PCBs (ug/L)						
Aroclor-1248	3	3	100%	0.70		1.00
INORGANICS (ug/L)						
Aluminum	3	3	100%	1051.50		12131.00
Barium	3	3	100%	460.40		1501.60
Calcium	3	3	100%	219970.00		263910.00
Chromium	3	3	100%	42.10		125.69
Cobalt	3	3	100%	3.36		13.04
Copper	3	3	100%	29.99		140.39
Iron	3	3	100%	31183.00		156090.00
Lead	3	3	100%	29.43		198.93
Magnesium	3	3	100%	52694.00		69371.00
Manganese	3	3	100%	412.49		1000.80
Nickel	3	3	100%	40.36		63.09
Potassium	3	3	100%	42867.00		66501.00
Silver	1	3	33%	1.60	(1)	1.60
Sodium	3	3	100%	67612.00		190190.00
Vanadium	1	3	33%	19.33	(1)	19.33
Zinc	3	3	100%	91.08		403.63

(1) Minimum value was actually non-detect. Value shown is the minimum of the samples in which the contaminant was detected.

TABLE 7-7
TOWN OF SALINA LANDFILL
SEDIMENT SUMMARY STATISTICS FOR THE ECOLOGICAL RISK ASSESSMENT

ANALYTE	Number of Times Detected	Total Number of Samples	Detection Frequency	Minimum Concentration		Maximum Concentration
VOCs (ug/kg)						
Acetone	9	10	90%	24.05	(1)	137.57
Methylene chloride	3	10	30%	3.33	(1)	6.77
Xylene (total	1	10	10%	4.74		4.74
SVOCs (ug/kg)						
2,4-Dinitropheno	1	10	10%	2000.00		2000.00
2,4-Dinitrotoluene	1	10	10%	2000.00	(1)	2000.00
Acenaphthene	3	10	30%	300.00	(1)	2900.00
Acenaphthylene	5	10	50%	400.00	(1)	1050.00
Anthracene	8	10	80%	310.00	(1)	2550.00
Benzo(a)anthracene	8	10	80%	1230.00	(1)	9100.00
Benzo(a)pyrene	8	10	80%	1090.00	(1)	7450.00
Benzo(b)fluoranthene	8	10	80%	1560.00	(1)	11700.00
Benzo(ghi)perylene	7	10	70%	270.00	(1)	2000.00
Benzo(k)fluoranthene	7	10	70%	470.00	(1)	2700.00
Bis(2-ethylhexyl)phthalate	9	10	90%	110.00	(1)	8000.00
Carbazole	3	10	30%	400.00	(1)	900.00
Chrysene	8	10	80%	1250.00	(1)	10150.00
Dibenzo(a,h)anthracene	4	10	40%	500.00	(1)	900.00
Dibenzofurar	1	10	10%	600.00	(1)	600.00
Di-n-butyl phthalate	2	10	20%	70.00	(1)	1800.00
Fluoranthene	8	10	80%	2940.00	(1)	19150.00
Fluorene	6	10	60%	600.00	(1)	4100.00
Indeno(1,2,3-cd)pyrene	7	10	70%	400.00	(1)	3200.00
Phenanthrene	8	10	80%	1010.00	(1)	9500.00
Pyrene	8	10	80%	1920.00	(1)	23700.00
PEST/PCBs (ug/kg)						
Aroclor-1248	8	10	80%	2100.00	(1)	81000.00
Aroclor-1260	8	10	80%	280.00	(1)	4800.00
INORGANICS (mg/kg)						
Aluminum	10	10	100%	2087.17		28287.67
Arsenic	10	10	100%	5.27		25.74
Barium	10	10	100%	58.40		387.52
Beryllium	6	10	60%	0.35	(1)	1.62
Cadmium	10	10	100%	5.28		83.68
Calcium	10	10	100%	35407.43		144801.55
Chromium	10	10	100%	5.29		1766.68
Cobalt	10	10	100%	1.73		31.12
Copper	10	10	100%	12.71		498.16
Iron	10	10	100%	7399.83		57252.37
Lead	1	10	10%	8.15		8.15
Magnesium	10	10	100%	3233.20		37003.86
Manganese	10	10	100%	181.46		1132.51
Mercury	8	10	80%	0.15	(1)	0.74
Nickel	9	10	90%	11.41		363.00
Potassium	10	10	100%	218.0		4895.68
Selenium	1	10	10%	1.97		1.97
Silver	8	10	80%	1.72	(1)	8.69
Sodium	9	10	90%	1165.51		4665.88
Thallium	1	10	10%	2.28		2.28
Vanadium	10	10	100%	11.82		76.71
Zinc	10	10	100%	44.06		1185.11
Cyanide	7	10	70%	2.24	(1)	11.67

(1) Minimum value was actually non-detect. Value shown is the minimum of the samples in which the contaminant was detected.

TABLE 7-8
TOWN OF SALINA LANDFILL
SOIL SUMMARY STATISTICS FOR THE ECOLOGICAL RISK ASSESSMENT
(DRY WEIGHT CONCENTRATIONS)

ANALYTE	Number of Times Detected	Total Number of Samples	Detection Frequency	Minimum Concentration		Maximum Concentration	Mean Concentration
VOCs (ug/kg)							
Bromoform	7	7	100%	10.0		12.0	11.14
Methylene chloride	2	7	29%	1.0	(1)	1.0	4.36
SVOCs (ug/kg)							
1,4-Dichlorobenzene	2	27	7%	46	(1)	47	370
2-Methylnaphthalene	11	27	41%	46	(1)	540	424
4-Chloroaniline	5	27	19%	75	(1)	210	360
Acenaphthene	16	27	59%	61	(1)	1000	412
Acenaphthylene	17	27	63%	43	(1)	1800	482
Anthracene	22	27	81%	50	(1)	2500	673
Benzo(a)anthracene	25	27	93%	40	(1)	8800	1988
Benzo(a)pyrene	25	27	93%	40	(1)	8700	1879
Benzo(b)fluoranthene	24	27	89%	60	(1)	13900	3131
Benzo(ghi)perylene	24	27	89%	40	(1)	5200	1565
Benzo(k)fluoranthene	25	27	93%	70	(1)	3700	831
Bis(2-ethylhexyl) phthalate	5	27	19%	40	(1)	1360	560
Carbazole	17	27	63%	47	(1)	700	313
Chrysene	26	27	96%	50	(1)	9100	2259
Dibenzo(a,h)anthracene	17	27	63%	99	(1)	960	494
Dibenzofuran	14	27	52%	47	(1)	3700	465
Fluoranthene	27	27	100%	41		18000	4021
Fluorene	18	27	67%	36	(1)	1100	387
Hexachlorobenzene	2	27	7%	110	(1)	130	369
Indeno(1,2,3-cd)pyrene	23	27	85%	70	(1)	5000	1549
Naphthalene	13	27	48%	50	(1)	670	434
Phenanthrene	26	27	96%	50	(1)	14000	2969
Pyrene	27	27	100%	44		16000	4638
Total PAHs	27	27	100%	2820		105560	28660
PEST/PCBs (ug/kg)							
4,4'-DDD	3	27	11%	6.9	(1)	27	19.06
4,4'-DDE	3	27	11%	1.7	(1)	15	17.78
4,4'-DDT	4	27	15%	0.61	(1)	20	18.45
Aldrin	2	27	7%	1.4	(1)	1.8	9.06
alpha-Chlordane	2	27	7%	4.4	(1)	6.9	9.36
beta-BHC	3	27	11%	2.1	(1)	2.7	9.18
delta-BHC	2	27	7%	0.31	(1)	0.9	8.99
gamma-BHC (Lindane)	2	27	7%	0.66	(1)	0.71	9.00
Dieldrin	4	27	15%	0.45	(1)	6.8	17.54
Endrin aldehyde	3	27	11%	0.62	(1)	14	18.08
Endrin ketone	3	27	11%	3.5	(1)	35	19.30
gamma-Chlordane	3	27	11%	0.72	(1)	7.9	9.49
Methoxychlor	3	27	11%	2.7	(1)	17	89.95
Aroclor-1248	2	27	7%	220	(1)	8400	492
INORGANICS (mg/kg)							
Aluminum	27	27	100%	5160		13000	7834
Arsenic	8	27	30%	2.6	(1)	7	2.18
Barium	27	27	100%	32.1		530	115
Beryllium	7	27	26%	0.36	(1)	0.48	0.35
Cadmium	27	27	100%	1.1		17.3	6.43
Calcium	27	27	100%	6860		119000	45982
Chromium	27	27	100%	10.7		127	47.19
Cobalt	26	27	96%	4.8	(1)	16.5	7.36
Copper	27	27	100%	18.3		860	90.93
Iron	27	27	100%	4800		19800	14698
Lead	27	27	100%	8.7		1163	146
Magnesium	27	27	100%	3580		27000	14038
Manganese	27	27	100%	273		557	375
Mercury	18	27	67%	0.22	(1)	2.6	0.63
Nickel	27	27	100%	10.9		82	33
Potassium	27	27	100%	557		2872	1242
Selenium	20	27	74%	4.6	(1)	22.8	11.68
Silver	13	27	48%	0.8	(1)	8	2.70
Sodium	7	27	26%	663	(1)	875	280
Thallium	10	27	37%	2.4	(1)	3.6	1.67
Vanadium	25	27	93%	11.9	(1)	22.4	15.72
Zinc	27	27	100%	39.4		1733	219
Cyanide	6	27	22%	0.7	(1)	3.3	1.03

(1) Minimum value was actually non-detect. Value shown is the minimum of the samples in which the contaminant was detected.

Comparisons of matrix-specific (surface water, leachate, sediment, and soil) screening values and contaminant concentrations are provided in Tables 7-9 through 7-12. These tables indicate the type of screening value used and the hazard quotient obtained by dividing the maximum concentration of each contaminant detected in each media by its screening values for that media. On these tables, a hazard quotient (HQ) greater than one indicates a contaminant concentration that exceeds a screening value. An exceedance of a screening value does not necessarily indicate that the contaminant poses a risk at the site, but rather indicates that the contaminant warrants further consideration. Such further consideration may encompass a more detailed evaluation, such as the use of a food chain model to predict exposure to higher trophic level organisms.

In determining whether a contaminant warrants further consideration, a variety of factors in addition to the screening-level hazard quotients were considered. For example, if a contaminant exceeded a particular screening value in a matrix but was only detected in a limited number (10% or less) of samples for that matrix, then that contaminant was not retained as a COPC for the ecological risk assessment. Finally, certain minerals which are known to be naturally ubiquitous in the earth's crust or elsewhere in the environment and/or are essential nutrients for normal health of biological organisms, were not considered further in the risk evaluation. These minerals include calcium, magnesium, potassium, and sodium. While it is possible for these chemicals to be toxic at very high doses, they were eliminated from evaluation to focus the assessment to those contaminants that are more likely to pose a threat to ecological receptors.

A summary discussion of the results of the screening for each matrix and the identification of COPCs for this ecological risk assessment is provided below. Descriptions of each COPC, including brief discussions of fate and transport, ecotoxicity, and carcinogenicity, are provided in Appendix E-4. A summary of physicochemical properties of each COPC is also provided in Appendix E-5.

7.1.2.1 Surface Water

The results of the surface water screening of contaminants is provided in Table 7-9. Since there were only five surface water samples collected on-site, none of the contaminants detected in surface water could be eliminated as COPCs using the detection frequency criteria. Only one VOC or SVOC (benzo[k]fluoranthene) was detected in surface water, but it did not have a screening value; therefore, it was retained as a COPC. Only one PCB (Aroclor 1248) was detected, and it was found to exceed its screening values. Both the NYSDEC Wildlife Standard and the Chronic EPA Water Quality Criteria were exceeded with hazard quotients (HQs) of 1167

TABLE 7-9
TOWN OF SALINA LANDFILL
ECOLOGICAL SCREENING LEVEL HAZARD QUOTIENTS FOR SURFACE WATER

ANALYTE	NYSDEC TOGS 1.1.1							EPA Water Quality Criteria	
	Standard				Guidance Value				
	H(FC)	A(C)	A(A)	W	H(FC)	A(C)	A(A)	Acute	Chronic
SVOCs (ug/L)									
Benzo(k)fluoranthene	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
PEST/PCBs									
Aroclor 1248	**140000**	--- (1)	--- (1)	**1166.667**	--- (1)	--- (1)	--- (1)	--- (1)	**10.00**
INORGANICS									
Aluminum	--- (1)	**2.38**	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	0.32	**2.73**
Barium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Calcium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Chromium	--- (1)	0.016	0.002032	--- (1)	--- (1)	--- (1)	--- (1)	0.14	0.21
Copper	--- (1)	0.70	0.43	--- (1)	--- (1)	--- (1)	--- (1)	0.43	0.70
Iron	--- (1)	**2.34**	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	0.70
Lead	--- (1)	0.60	0.02	--- (1)	--- (1)	--- (1)	--- (1)	0.04	0.90
Magnesium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Manganese	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Nickel	--- (1)	0.03	0.003	--- (1)	--- (1)	--- (1)	--- (1)	0.003	0.03
Potassium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Sodium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Vanadium	--- (1)	0.13	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Zinc	--- (1)	0.32	0.22	--- (1)	--- (1)	--- (1)	--- (1)	0.22	0.22
Cyanide	0.002	**3.58**	0.85	--- (1)	--- (1)	--- (1)	--- (1)	0.85	**3.58**

(1) Screening value was not available.

TABLE 7-10
TOWN OF SALINA LANDFILL
ECOLOGICAL SCREENING LEVEL HAZARD QUOTIENTS FOR LEACHATE

ANALYTE	NYSDEC TOGS 1.1.1							EPA Water Quality Criteria	
	Standard				Guidance Value				
	H(FC)	A(C)	A(A)	W	H(FC)	A(C)	A(A)	Acute	Chronic
VOCs (ug/L)									
Benzene	0.38	--- (1)	--- (1)	--- (1)	--- (1)	0.02	0.005	--- (1)	--- (1)
Chlorobenzene	0.06	**4.40**	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
SVOCs (ug/L)									
1,4-Dichlorobenzene	--- (1)	0.44	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
PESTICIDES/PCBs (ug/L)									
Aroclor-1248	**1000000**	--- (1)	--- (1)	**8333**	--- (1)	--- (1)	--- (1)	--- (1)	**71**
INORGANICS (ug/L)									
Aluminum	--- (1)	**121**	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	**16.17**	**139**
Barium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Calcium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Chromium	--- (1)	0.86	0.11	--- (1)	--- (1)	--- (1)	--- (1)	**7.86**	**11.43**
Cobalt	--- (1)	**2.61**	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Copper	--- (1)	**7.71**	**4.76**	--- (1)	--- (1)	--- (1)	--- (1)	**4.76**	**7.71**
Iron	--- (1)	**520**	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	**156**
Lead	--- (1)	**21.51**	0.84	--- (1)	--- (1)	--- (1)	--- (1)	**1.26**	**32.09**
Magnesium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Manganese	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Nickel	--- (1)	0.60	0.07	--- (1)	--- (1)	--- (1)	--- (1)	0.07	0.60
Potassium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Silver	--- (1)	**16.00**	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	0.11	--- (1)
Sodium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Vanadium	--- (1)	**1.38**	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Zinc	--- (1)	**2.40**	**1.70**	--- (1)	--- (1)	--- (1)	--- (1)	**1.70**	**1.69**

(1) Screening value was not available.

TABLE 7-11
TOWN OF SALINA LANDFILL
ECOLOGICAL SCREENING LEVEL HAZARD QUOTIENTS FOR SEDIMENT

ANALYTE	NYSDEC			Jones et al. (1997)	Persaud et al. (1993)		Long et al. (1995) or Long and Morgan (1990)	
	Acute	Chronic	Bioaccum.	EqP	LEL	SEL	ER-L	ER-M
VOCs								
Acetone	--- (1)	--- (1)	--- (1)	73.5	--- (1)	--- (1)	--- (1)	--- (1)
Methylene chloride	--- (1)	--- (1)	--- (1)	0.1	--- (1)	--- (1)	--- (1)	--- (1)
Xylene (total)	0.01	0.1	--- (1)	0.1	--- (1)	--- (1)	--- (1)	--- (1)
SVOCs								
2,4-Dinitrophenol	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
2,4-Dinitrotoluene	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Acenaphthene	--- (1)	10.4	--- (1)	10.4	--- (1)	--- (1)	181	5.8
Acenaphthylene	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	23.9	1.6
Anthracene	72.9	671.1	--- (1)	53.9	11.6	3.2	29.9	2.3
Benzo(a)anthracene	39,565	303,333	--- (1)	384.6	28.4	2.9	34.9	5.7
Benzo(a)pyrene	--- (1)	--- (1)	--- (1)	247.4	20.1	2.4	17.3	4.7
Benzo(b)fluoranthene	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Benzo(g,h,i)perylene	--- (1)	--- (1)	--- (1)	--- (1)	11.8	2.9	--- (1)	--- (1)
Benzo(k)fluoranthene	--- (1)	--- (1)	--- (1)	--- (1)	11.3	0.9	--- (1)	--- (1)
bis(2-ethylhexyl)phthalate	--- (1)	18.6	--- (1)	0.04	--- (1)	--- (1)	--- (1)	--- (1)
Carbazole	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Chrysene	--- (1)	--- (1)	--- (1)	--- (1)	29.9	10.3	26.4	3.6
Dibenzo(a,h)anthracene	--- (1)	--- (1)	--- (1)	--- (1)	15.0	3.2	14.2	3.5
Dibenzofuran	--- (1)	--- (1)	--- (1)	6.6	--- (1)	--- (1)	--- (1)	--- (1)
Di-n-butyl phthalate	--- (1)	--- (1)	--- (1)	0.8	--- (1)	--- (1)	--- (1)	--- (1)
Fluoranthene	--- (1)	14.4	--- (1)	14.4	25.5	8.7	31.9	3.8
Fluorene	854	7,593	--- (1)	35.3	21.6	11.9	216	7.6
Indeno(1,2,3-cd)pyrene	--- (1)	--- (1)	--- (1)	--- (1)	16.0	4.6	--- (1)	--- (1)
Phenanthrene	--- (1)	24.5	--- (1)	24.5	17.0	4.6	39.6	6.3
Pyrene	564	5,152	--- (1)	--- (1)	48.4	13.0	35.6	9.1
PESTICIDES/PCBs								
Aroclor-1248	13.6	1951	26910	377	2700	251	--- (1)	--- (1)
Aroclor-1260	0.8	116	1595	0.005	960	93.0	--- (1)	--- (1)

INORGANICS	Lowest Effect Leve	Severe Effect Leve	EqP	LEL	SEL	ER-L	ER-M
Aluminum	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Arsenic	3.1	0.4	--- (1)	4.3	0.8	3.1	0.4
Barium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Beryllium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Cadmium	69.7	8.7	--- (1)	139.5	8.4	69.7	8.7
Calcium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Chromium	21.8	4.8	--- (1)	67.9	16.1	21.8	4.8
Cobalt	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Copper	14.7	1.8	--- (1)	31.1	4.5	14.7	1.8
Iron	2.9	1.4	--- (1)	2.9	1.4	--- (1)	--- (1)
Lead	0.2	0.04	--- (1)	0.3	0.03	0.2	0.04
Magnesium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Manganese	2.5	1.03	--- (1)	2.5	1.03	--- (1)	--- (1)
Mercury	4.9	1.05	--- (1)	3.7	0.4	4.9	1.05
Nickel	17.4	7.0	--- (1)	22.7	4.8	17.4	7.0
Potassium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Selenium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Silver	8.7	2.3	--- (1)	--- (1)	--- (1)	8.7	2.3
Sodium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Thallium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Vanadium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Zinc	7.9	2.9	--- (1)	9.9	1.4	7.9	2.9
Cyanide	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)

(1) Screening value was not available.

TABLE 7-12
TOWN OF SALINA LANDFILL
ECOLOGICAL SCREENING LEVEL HAZARD QUOTIENTS FOR SOIL

ANALYTE	Efroymson et al. (1997a)		Efroymson et al. (1997b)	U.S. EPA Region III Screening Criteria	
	Toxicity to Earthworms	Toxicity to Microorgansims	Phytotoxicity	Fauna	Flora
VOCs					
Bromoform	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Methylene chloride	--- (1)	--- (1)	--- (1)	0.003	0.003
SVOCs					
1,4-Dichlorobenzene	0.002	--- (1)	--- (1)	0.5	0.5
2-Methylnaphthalene	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
4-Chloroaniline	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Acenaphthene	--- (1)	--- (1)	0.05	**10**	**10**
Acenaphthylene	--- (1)	--- (1)	--- (1)	**18**	**18**
Anthracene	--- (1)	--- (1)	--- (1)	**25**	**25**
Benzo(a)anthracene	--- (1)	--- (1)	--- (1)	**88**	**88**
Benzo(a)pyrene	--- (1)	--- (1)	--- (1)	**87**	**87**
Benzo(b)fluoranthene	--- (1)	--- (1)	--- (1)	**139**	**139**
Benzo(g,h,i)perylene	--- (1)	--- (1)	--- (1)	**52**	**52**
Benzo(k)fluoranthene	--- (1)	--- (1)	--- (1)	**37**	**37**
bis(2-Ethylhexyl)phthalate	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Carbazole	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Chrysene	--- (1)	--- (1)	--- (1)	**91**	**91**
Dibenzo(a,h)anthracene	--- (1)	--- (1)	--- (1)	**10**	**10**
Dibenzofuran	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Fluoranthene	--- (1)	--- (1)	--- (1)	**180**	**180**
Fluorene	0.04	--- (1)	--- (1)	**11**	**11**
Hexachlorobenzene	--- (1)	0.0001	--- (1)	--- (1)	--- (1)
Indeno(1,2,3-cd)pyrene	--- (1)	--- (1)	--- (1)	**50**	**50**
Napthalene	--- (1)	--- (1)	--- (1)	**7**	**7**
Phenanthrene	--- (1)	--- (1)	--- (1)	**140**	**140**
Pyrene	--- (1)	--- (1)	--- (1)	**160**	**160**
PESTICIDES/PCBs					
4,4'-DDD	--- (1)	--- (1)	--- (1)	0.27	0.27
4,4'-DDE	--- (1)	--- (1)	--- (1)	0.15	0.15
4,4'-DDT	--- (1)	--- (1)	--- (1)	0.20	0.20
Aldrin	--- (1)	--- (1)	--- (1)	0.02	0.02
alpha-Chlordane	--- (1)	--- (1)	--- (1)	0.07	0.07
beta-BHC	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
delta-BHC	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
gamma-BHC (Lindane)	--- (1)	--- (1)	--- (1)	0.01	0.01
Dieldrin	--- (1)	--- (1)	--- (1)	0.07	0.07
Endrin aldehyde	--- (1)	--- (1)	--- (1)	0.14	0.14
Endrin ketone	--- (1)	--- (1)	--- (1)	0.35	0.35
gamma-Chlordane	--- (1)	--- (1)	--- (1)	0.08	0.08
Methoxychlor	--- (1)	--- (1)	--- (1)	0.17	0.17
Aroclor-1248	--- (1)	--- (1)	0.21	**84**	--- (1)
INORGANICS					
Aluminum	--- (1)	**22**	**260**	--- (1)	**13,000**
Arsenic	0.1	0.1	0.7	--- (1)	0.02
Barium	--- (1)	0.2	**1.1**	**1.20**	--- (1)
Beryllium	--- (1)	--- (1)	0.05	--- (1)	**24.0**
Cadmium	0.9	0.9	**4**	--- (1)	**6.92**
Calcium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Chromium	**318**	**13**	**127**	**16,947**	**6,355**
Cobalt	--- (1)	0.02	0.8	0.08	0.17
Copper	**17**	**9**	**9**	--- (1)	**57.3**
Iron	--- (1)	**99**	--- (1)	**1,650**	**6.07**
Lead	**2**	**1.3**	**23**	**116,320**	**582**
Magnesium	--- (1)	--- (1)	--- (1)	**6.14**	**6.14**
Manganese	--- (1)	**6**	**1.1**	**1.69**	**1.86**
Mercury	**26**	0.1	**9**	**45**	**45**
Nickel	0.4	0.9	**3**	--- (1)	**41.2**
Potassium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Selenium	0.3	0.2	**23**	**12.7**	**12.7**
Silver	--- (1)	0.2	**4**	--- (1)	**816,327**
Sodium	--- (1)	--- (1)	--- (1)	--- (1)	--- (1)
Thallium	--- (1)	--- (1)	**4**	--- (1)	**3,600**
Vanadium	--- (1)	**1.1**	**11**	0.39	**44.8**
Zinc	**9**	**17**	**35**	--- (1)	**173**
Cyanide	--- (1)	--- (1)	--- (1)	**660**	--- (1)

(1) Screening value was not available.

and 10, respectively. Therefore, Aroclor 1248 was retained as a COPC. Of the inorganics tested, only three were found to exceed any of the screening values. These include aluminum, iron and cyanide. Aluminum was found to exceed the NYSDEC chronic standard for aquatic life (HQ=2.38), as well as the chronic EPA Water Quality Criteria (HQ=2.73). Due to these exceedences, aluminum was retained as a COPC. The maximum concentration of iron was found to exceed the NYSDEC chronic standard for aquatic life (HQ=2.34) and for this reason was retained as a COPC. The maximum concentration of cyanide exceeded the NYSDEC Chronic Standard for Aquatic life and the chronic EPA Water Quality Criteria (HQs of 3.58 and 3.58).

A variety of other inorganics were also detected in surface water, but no surface water screening value exists for them. These include barium, calcium, magnesium, manganese, potassium, and sodium. Of these metals, calcium, magnesium, potassium and sodium were eliminated as COPCs in surface water because they are essential nutrients for survival and growth to most organisms and are ubiquitous in the earth's crust, as discussed previously. Barium and manganese were both detected in 100% of the surface water samples taken; therefore, barium and manganese were retained as COPCs in this ecological risk assessment.

Based on these results, the following surface water contaminants were retained as COPCs in this ecological risk assessment:

SVOCs	**Inorganics**
benzo[k]fluoranthene	Aluminum
	Barium
PCBs	Iron
Aroclor 1248	Manganese
	Cyanide

7.1.2.2 Leachate

The results of the screening of contaminants in leachate are provided in Table 7-10. Since only three samples of leachate were collected, if the maximum concentration of a contaminant exceeded a screening value for just one sample, it was retained as a COPC. Of the VOCs detected, only chlorobenzene exceeded any of its screening values for surface water. Chlorobenzene was detected above the NYSDEC chronic standard for aquatic life (HQ=4.4) and for this reason, it was retained as a COPC. No SVOCs exceeded any of the screening values. Aroclor 1248 was the only PCB that was detected in leachate, and it was found to exceed the NYSDEC Wildlife standard (HQ=8333), and the chronic EPA Water Quality Criteria (HQ=71). Therefore, Aroclor 1248 was retained as a COPC.

Of the inorganics tested, aluminum, chromium, cobalt, copper, iron, lead, silver, vanadium and zinc were found to exceed their screening values. Aluminum was found to exceed the NYSDEC chronic standard for aquatic life (HQ = 121) as well as both the acute and chronic EPA Water Quality Criteria (HQs = 16.17 and 139, respectively). For this reason, aluminum was retained as a COPC. Chromium was found to exceed both the acute and chronic EPA Water Quality Criteria, with hazard quotients equaling 7.86 and 11.43, respectively; therefore, it was retained as a COPC. The maximum concentration of cobalt was found to exceed the NYSDEC chronic standard for aquatic life (HQ=2.6); therefore, cobalt was retained as a COPC. Copper exceeded the NYSDEC chronic and acute standards for aquatic life as well as the acute and chronic EPA water quality criteria. Hazard quotients ranged from 4.76 to 7.71; therefore, copper was retained as a COPC. The maximum concentration of iron exceeded NYSDEC's and EPA's chronic screening values, with HQs of 520 and 156, respectively; therefore, iron was retained as a COPC. Lead exceeded the NYSDEC chronic standard for aquatic life as well as both the acute and chronic EPA water quality criteria (HQs from 1.26 to 32.1). For this reason, lead was retained as a COPC. Silver exceeded NYSDEC's chronic standard for aquatic life (HQ= 16); therefore, silver was retained as a COPC. Vanadium was found to exceed the NYSDEC chronic standard for aquatic life, with an HQ of 1.38; therefore, vanadium was retained as a COPC for this ecological risk assessment. Finally, zinc exceeded NYSDEC's and EPA's acute and chronic standards and criteria for aquatic life. Hazard quotients for zinc ranged from 1.7 to 2.4; therefore, it too was retained as a COPC.

A variety of contaminants were detected in leachate, but no screening values exist for them. These include barium, calcium, magnesium, manganese, potassium and sodium. Calcium, magnesium, potassium and sodium were eliminated as COPCs in leachate because they are essential nutrients for survival and growth of most organisms and are ubiquitous in the earth's crust, as discussed previously. The remaining contaminants, barium and manganese, were found in 100% of the leachate samples and therefore were retained as COPCs.

Based on these results, the following leachate contaminants were retained as COPCs in this ecological risk assessment:

VOCs
Chlorobenzene

PCBs
Aroclor 1248

Inorganics
Aluminum
Barium
Chromium
Cobalt
Copper
Iron
Lead
Manganese
Silver
Vanadium
Zinc

7.1.2.3 Sediment

The results of the screening of contaminants in sediment are provided in Table 7-11. Only one of the VOCs, acetone, exceeded screening values for sediment. Since acetone was detected in 90% of the sediment samples, and since it exceeded the EqP screening value, with an HQ of 73.5, it was retained as a COPC. Of the 21 SVOCs detected, 16 were found to exceed the screening values for sediment. Of these, fifteen are classified as polynuclear aromatic hydrocarbons (PAHs). PAHs that exceeded their screening values include acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. With the exception of dibenzofuran, all of these compounds were detected in greater than 10% of the samples analyzed. Therefore, all of these PAHs, except for dibenzofuran, were retained as COPCs in this ecological risk assessment.

The only other SVOC that exceeded its sediment screening value was bis(2-ethylhexyl)phthalate, which exceeded the NYSDEC's chronic screening value for sediment (HQ=18.6) and was found in 90% of sediment samples analyzed. Therefore, bis(2-ethylhexyl)phthalate was retained as a COPC.

Two PCBs were found to exceed their screening values. Aroclors 1248 and 1260 had hazard quotients greater than one ranging from 13.6 to 26,910. They were each detected in 80% of the samples. Due to the magnitude of their hazard quotients and their high frequencies of detection, both Aroclors were retained as COPCs.

Ten of the inorganics detected in sediment exceeded their screening values. These include arsenic, cadmium, chromium, copper, iron, manganese, mercury, nickel, silver and zinc. Arsenic was found to be in exceedence of the LEL and ER-L screening values for soil (HQs = 4.3 and 3.1, respectively). For cadmium, chromium, copper, nickel, and zinc, maximum concentrations exceeded the LEL, SEL, ER-L and ER-M screening values, with HQs ranging from 1.4 to 140. Since these contaminants were found in at least 90% of the sediment samples taken, they were all retained as COPCs for this ecological risk assessment. The maximum concentrations of iron and manganese were found to exceed the LEL and SEL screening values (HQs ranging from 1.03 to 2.9). Since iron and manganese were detected in 100% of sediment samples, they were retained as COPCs. Maximum mercury concentrations exceeded the LEL, ER-L and ER-M screening values, and hazard quotients ranged from 1.05 to 4.9. Since mercury was present in 80% of the sediment samples, it was retained as a COPC. Silver was found to exceed ER-L and ER-M screening values, with HQs of 8.7 and 2.3, respectively. Silver was detected in 80% of the sediment samples taken; therefore, silver was also retained as a COPC for this study.

A variety of other contaminants were also detected in sediment for which no screening values exist. These include benzo(b)fluoranthene, carbazole, 2,4-dinitrotoluene, 2,4-dinitrophenol, aluminum, barium, beryllium, calcium, cobalt, magnesium, potassium, selenium, sodium, thallium, vanadium and cyanide. Of the inorganics, calcium, magnesium, potassium and sodium were eliminated as COPCs in sediment because they are essential nutrients for survival and growth of most organisms and are ubiquitous in the earth's crust, as discussed previously. The remainder of the inorganics occurred in the majority of the sediment samples and were retained as COPCs. Benzo(b)fluoranthene and carbazole were also retained as COPCs because they were detected in greater than 10% of the samples. The remaining organic contaminants, 2,4-dinitrophenol and 2,4-dinitrotoluene, were eliminated as COPCs because they were detected in only 10% of the samples collected.

Based on these results, the following sediment contaminants were retained as COPCs in this ecological risk assessment:

<u>VOCs</u>	**<u>PCBs</u>**
Acetone	Aroclor 1248
	Aroclor 1260

SVOCs	**INORGANICS**
Acenaphthene	Aluminum
Acenaphthylene	Arsenic
Anthracene	Barium
Benzo(a)anthracene	Beryllium
Benzo(a)pyrene	Cadmium
Benzo(b)fluoranthene	Chromium
Benzo(g,h,i)perylene	Cobalt
Benzo(k)fluoranthene	Copper
bis(2-ethylhexyl)phthalate	Iron
Carbazole	Manganese
Chrysene	Mercury
Dibenzo(a,h)anthracene	Nickel
Fluoranthene	Selenium
Fluorene	Silver
Indeno(1,2,3-cd)pyrene	Thallium
Phenanthrene	Vanadium
Pyrene	Zinc
	Cyanide

7.1.2.4 Surface Soil

The results of the surface soil screening of contaminants is provided in Table 7-12. Methylene chloride, a common laboratory contaminant, was the only VOC that was detected that had a screening value. However, it did not exceed its screening values and was therefore not retained as a COPC. A variety of SVOCs detected were found to exceed their screening values. All of these were PAHs, which included acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, napthalene, phenanthrene, and pyrene. Hazard quotients for these PAHs ranged from 7 to 180.Since all of these PAHs were detected in at least 10% of the soil samples collected, they were all retained as COPCs.

Pesticides were detected in surface soil; however, their concentrations did not exceed their screening values. Aroclor-1248 was the only PCB detected in surface soil, and the maximum concentration exceeded its screening value (HQ=84). However, since it was only detected in two (7%) of the samples, it was not retained as a COPC for soil. Therefore, no pesticides or PCBs were retained as COPCs for soil.

A variety of inorganics exceeded their screening values in surface soil and were detected in greater than 10% of the surface soil samples collected. These include aluminum, barium, beryllium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, thallium, vanadium, zinc, and cyanide. Magnesium was eliminated as a COPC in soil because it is an essential nutrient for survival and growth of most organisms and is ubiquitous in the earth's crust, as discussed previously. Of the remaining inorganics, aluminum and vanadium exceeded their screening values for toxicity to microorganisms, as well as the phytotoxicity screening value and the U.S. EPA Region III Screening Criteria for Flora (HQs ranged from 1.1 to 13,000). Therefore, both aluminum and vanadium were retained as COPCs. Barium exceeded the phyotoxicity screening value as well as the U.S. EPA Region III Screening Criteria for Fauna, with hazard quotients of 1.1 to 1.2, respectively. Therefore, barium was retained as a COPC. Beryllium exceeded the EPA Region III screening Criteria for Flora (HQ = 24.0); therefore, beryllium was retained as a COPC. Cadmium, nickel, silver, and thallium exceeded their phytotoxicity screening values as well as the U.S. EPA Region III Screening Criteria for Flora (HQs ranging from 3 to 816,327). Therefore, cadmium, nickel, silver, and thallium were retained as COPCs. Chromium and lead exceeded all five of the screening values used in this analysis, with hazard quotients ranging from 1.3 to 116,320; therefore, chromium and lead were both retained as COPCs. Maximum levels of copper and zinc were found to exceed their screening values for toxicity to earthworms, toxicity to microorganisms, phytotoxicity, and the U.S. EPA Region III Screening Criteria for Flora, with HQ values ranging from 9 to 173. Therefore, copper and zinc were retained as COPCs. Iron was retained as a COPC because its concentrations exceeded its screening values for toxicity to microorganisms and the U.S. EPA Region III Screening Criteria for Fauna and Flora. Manganese exceeded its screening values for toxicity to microorganisms, phytotoxicity, and the U.S. EPA Region III Screening Criteria for Fauna and Flora. Therefore, it was retained as a COPC. The maximum concentrations of mercury were found to exceed soil screening values for toxicity to earthworms, phytotoxicity, and the U.S. EPA Region III Screening Criteria for Fauna and Flora, with HQ values ranging from 9 to 45. Therefore, mercury was retained as a COPC. Maximum concentrations of selenium exceeded its phytotoxicity screening value as well as the U.S. EPA

Region III Screening Criteria for Flora and Fauna (HQs ranged from 12.7 to 23); therefore, selenium was retained as a COPC. Cyanide was also retained as a COPC because it exceeded the EPA Region III Screening Criteria for Fauna with a HQ of 660.

A variety of other contaminants were also detected in soil, for which no screening values exist. These include bromoform, bis(2-ethylhexyl)phthalate, carbazole, 4-chloroaniline, dibenzofuran, 2-methylnaphthalene, beta-BHC, delta-BHC, calcium, potassium and sodium. Calcium, potassium, and sodium were eliminated as COPCs because they are essential nutrients for survival and growth of most organisms and are ubiquitous in the earth's crust, as discussed previously. Beta-BHC and delta-BHC were eliminated as COPCs because they only occurred in 11% and 7% of the samples taken, respectively, and their maximum concentrations did not exceed the screening values for gamma-BHC (lindane). The remaining contaminants with no screening values were detected in at least 19% of soil samples taken; therefore, they were retained as COPCs for this ecological risk assessment.

Based on these results, the following surface soil contaminants were retained as COPCs in this ecological risk assessment:

VOCs
Bromoform

SVOCs
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
bis(2-ethylhexyl)phthalate
Carbazole
4-Chloroaniline
Chrysene
Dibenzo(a,h)anthracene
Dibenzofuran

INORGANICS
Aluminum
Barium
Beryllium
Cadmium
Chromium
Copper
Iron
Lead
Manganese
Mercury
Nickel
Selenium
Silver
Thallium
Vanadium
Zinc
Cyanide

Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylnaphthalene
Naphthalene
Phenanthrene
Pyrene

7.2 COMPLETE EXPOSURE PATHWAYS

Historical and recent information indicates that contamination at the Town of Salina Landfill may represent a risk to ecological receptors inhabiting areas on or adjacent to the site. Therefore, an evaluation of the potential routes of contaminant migration and exposure to ecological receptors was conducted.

It was determined that there is little potential for plants and animals to be exposed to contaminants directly via groundwater, since ecological receptors of concern generally do not come in direct contact with groundwater. Although minor volatilization of VOCs and SVOCs from the groundwater through the overlying soils into the air could potentially pose a risk via inhalation, this potential exposure is expected to be insignificant when compared with the potential exposure via direct contact, ingestion, or biomagnification through the food chain from other media. Furthermore, while contaminants in groundwater often migrate into surface waters and therefore become much more bioavailable to ecological receptors, this pathway is taken into account by considering exposure pathways in which organisms are exposed to contaminants in surface water. Therefore, for the purposes of this ecological risk assessment, the exposure pathway via groundwater is considered to be incomplete.

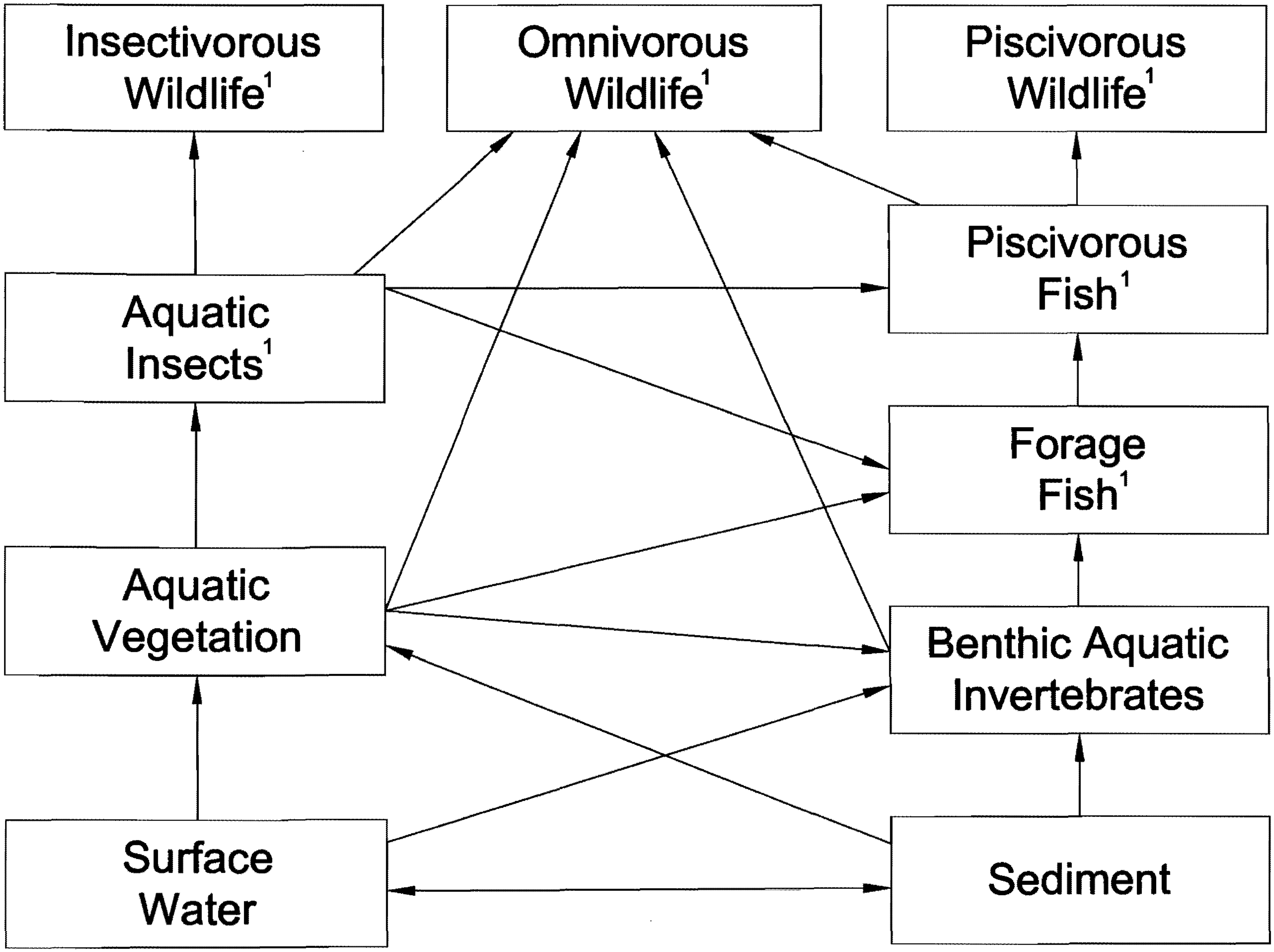
Exposure to contaminants via subsurface soils was also determined to be an incomplete pathway. Because wildlife generally do not burrow into these deeper soils (except for a few species including woodchuck and fox) they are not expected to be exposed to contaminants in these soils. Plants, predominantly grasses, on the landfill are also not expected to have roots in the subsurface soils, although trees and shrubs may. However, there are few trees and shrubs present on the landfill. Furthermore, because contaminant uptake by plants is low (most contaminants sorb to soil particles and are biologically unavailable), the subsurface soil exposure pathway for plants is generally an incomplete exposure pathway. A potential inhalation exposure pathway for VOCs and SVOCs could occur from the subsurface soils to soil vapor and air due to volatilization. However, this pathway is probably insignificant when compared to exposure from direct contact with or ingestion of other media or biomagnification in the food chain.

Based on the results of the ecological surveys and chemical contaminant analyses, complete pathways for ecological receptors to be exposed to contaminants in surface soils, surface water, leachate, and sediments of Ley Creek (old and new channels) were identified. These were determined to be the primary pathways of exposure of ecological receptors to site-related contaminants.

Contaminants in leachate and soil from the landfill can migrate to the surface waters and sediments of Ley Creek and the on-site drainageways. In addition, contaminants in surface water and sediment are in constant flux between these two media. Volatilization from surface waters, surface soils, and leachate can also take place for some contaminants. All of these contaminant migration pathways contribute to a complex and dynamic state of flux between these different media. As a result, all of the ecological exposure pathways are interconnected. However, for the purposes of this discussion, the exposure pathways will be divided into those that are primarily terrestrial and those that are primarily aquatic.

Hypothetical food webs representing the complete exposure pathways identified for the site are provided in Figures 7-1 and 7-2. For the aquatic exposure pathway, contaminants in surface water and sediment may pass through the food chain, starting with benthic invertebrates and primary producers (aquatic vegetation), including macrophytes, phytoplankton, and algae and their products of decomposition. Secondary consumers, including other benthic invertebrates, aquatic invertebrates, forage fish, and some omnivorous wildlife accumulate contaminants by consuming phytoplankton, algae, macrophytes and other invertebrates. Aquatic invertebrates are consumed by insectivorous and some omnivorous wildlife. Forage fish become prey to piscivorous fish, some omnivorous wildlife, and piscivorous wildlife. Piscivorous fish are in turn also consumed by some piscivorous wildlife. In addition, all secondary and higher trophic level organisms may be exposed to contaminants via direct contact with surface water and sediment.

For the terrestrial exposure pathway, contaminants in soils may also pass through the food chain, starting with primary producers, such as terrestrial plants. Plants are consumed by terrestrial herbivorous wildlife as well as by soil microorganisms. Plants and leaf litter may also decompose to detritus. Detritus and soil microorganisms are then consumed by terrestrial insects



1. Organisms at these tropic levies may also be exposed to contaminants via direct contact with or ingestion of surface water and/or sediment.

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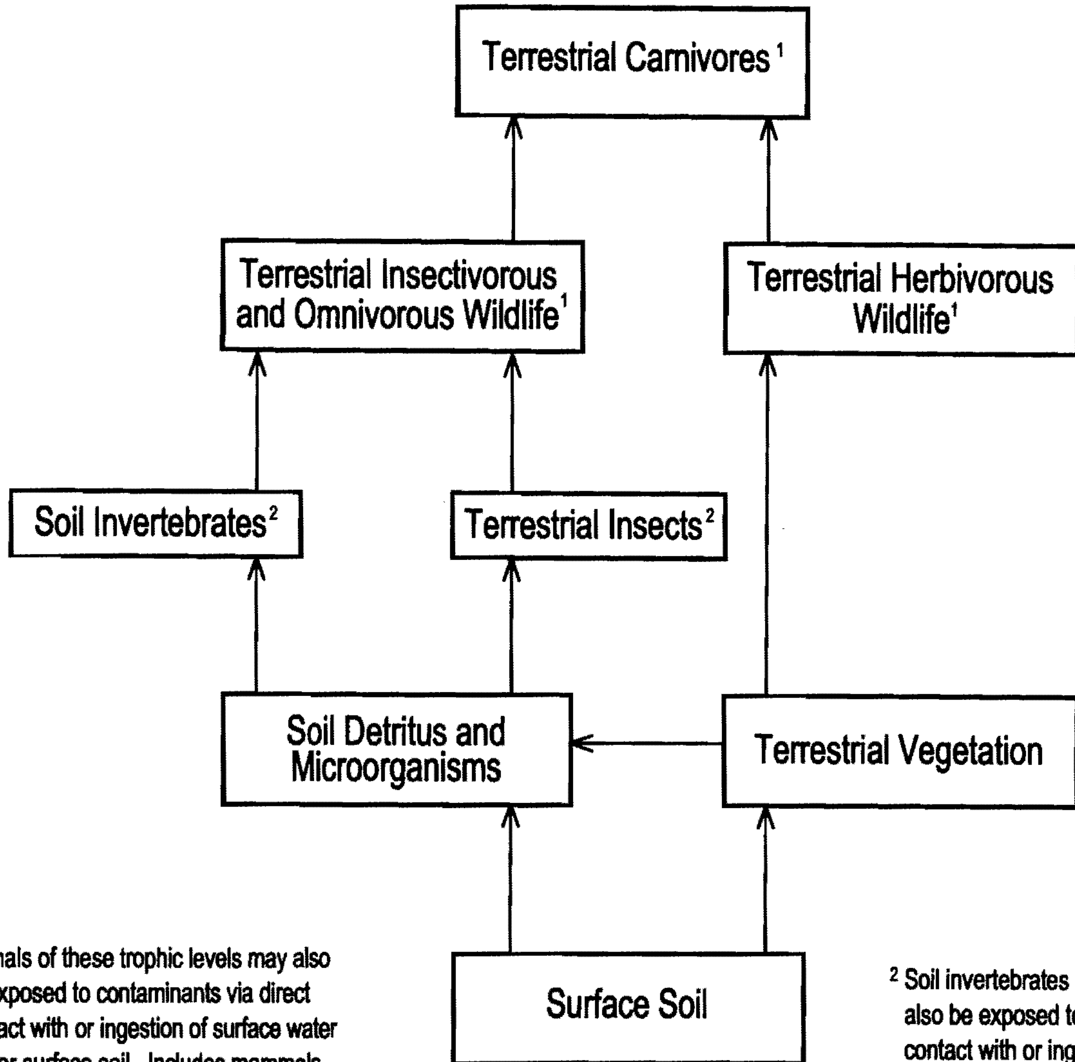
FIGURE 7–1

GENERIC AQUATIC FOOD WEB SHOWING POTENTIAL ROUTES OF CONTAMINENT TRANSFER FROM CONTAMINATED ENVIRONMENTS

TOWN OF SALINA REMEDIAL INVESTIGATION

I:\6967\DRAWINGS\REMEDIAL INVESTIGATION\ FIG1-1DWG 04/18/00 3:10 PM JFT PLOT 1 TO 1



[1] Animals of these trophic levels may also be exposed to contaminants via direct contact with or ingestion of surface water and/or surface soil. Includes mammals, birds, reptiles, and amphibians.

[2] Soil invertebrates and terrestrial insects may also be exposed to contaminants via direct contact with or ingestion of surface soil

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FIGURE 7–2

GENERIC TERRESTRIAL FOOD WEB SHOWING POTENTIAL ROUTES OF CONTAMINENT TRANSFER FROM CONTAMINATED ENVIRONMENTS

TOWN OF SALINA REMEDIAL INVESTIGATION

k:\8667\DRAWINGS\REMEDIAL INVESTIGATION\ FIG1-1DWG 04/18/00 3:10 PM JFT PLOT 1 TO 1

and soil invertebrates. Higher trophic level receptors such as insectivorous and omnivorous small mammals, birds, reptiles, and amphibians in turn consume these insects and soil invertebrates. Finally, even higher trophic level receptors (terrestrial carnivores) will consume herbivorous, insectivorous, and omnivorous wildlife.

In both the aquatic and terrestrial food chains described above, as indicated in Figures 7-1 and 7-2, ecological receptors are not only exposed to contaminants through consumption of contaminated food, but also via direct contact with and/or ingestion of contaminated surface water, sediment, and soil. Volatilization of some contaminants is also possible, resulting in potential exposure via inhalation, but this is expected to be minor compared with the direct contact and ingestion pathways. Therefore, the exposure route via inhalation is not represented in Figures 7-1 and 7-2.

7.3 PROBLEM FORMULATION

The results of the site ecological surveys provided information on the organisms that are known or expected to be present at the site (Section 3.3.1). All of the organisms identified or expected to be present at the site are potential ecological receptors at the site. The organisms listed in Tables 3-1 through 3-6, as well as the complete exposure pathways identified above, provided the basis for the selection of the assessment and measurement endpoints evaluated in this ecological risk assessment.

Early in the RI/FS process, it was determined that since the Town of Salina Landfill is part of the larger Onondaga Lake Superfund Site, the risks associated with Ley Creek surface water and sediment would not be quantified in the Salina Landfill ecological risk assessment. Therefore, only the potential ecological receptors associated with on-site exposure pathways are considered further in this risk assessment.

Some on-site surface waters and sediments are present on the Town of Salina Landfill in the form of ditches and swales (Figure 3-5). Some small forage fish (blacknose dace and fathead minnows) were observed in these areas during the ecological surveys. However, the fish observed in these ditches are expected to have originated from Ley Creek and/or Beartrap Creek. It is probable that the fish inhabiting the ditch that runs parallel with the New York State Thruway at the northern end of the site make their way into this ditch by swimming from Beartrap Creek, which is believed to be connected to the northern ditch. Alternatively, during high flow conditions, fish from Ley Creek may be able to enter the discharge pipe that connects Ley Creek with the on-site ditch that runs north-south through the middle of the landfill. Finally, fish may enter the on-site swale that runs north-south along the western portion of the site by swimming from Ley Creek directly into this swale when it is flooded, since this swale is connected to the creek during high flow conditions.

The majority of these ditches are only expected to serve as temporary habitat for fish during periods of high flow, when the surface waters in Ley Creek and surface runoff from adjacent areas fill these ditches and swales. During dry conditions, these ditches probably dry up, causing high mortality of the fish utilizing these areas. Furthermore, the bottom substrate of these ditches consists of fine muck, which would not be expected to support abundant or diverse communities of invertebrates to sustain healthy fish populations.

A qualitative evaluation of the contaminant levels measured in these areas is provided here. For the current investigation, one sediment and one surface water sample were collected from a location (SW/SED-25) at the confluence of the north-south ditch bisecting the site and the ditch running parallel to the Thruway (Figure 2-7). In addition, as discussed in Section 1.2.3, in 1994, Ecology and Environment collected and analyzed five samples of surface water and sediment from the on-site drainageways. Two of these samples were collected from the ditch running parallel to the Thruway (SW/SED-5 and SW/SED-8), and three were collected from the swale at the southwestern portion of the site (SW/SED-7, SW/SED-11, and SW/SED-12). The sampling location for the current investigation (SW/SED-25) corresponds to one of the historical sampling locations (SW/SED-5).

The analytical results of the historical samples collected from the swale at the southeast corner of the site indicate that metals concentrations in the swale were greater than metals concentrations in Ley Creek, but PCB concentrations in the swale were less than those in Ley Creek. This indicates that PCB concentrations in the swale were probably derived primarily from Ley Creek during flooding events, while the metals concentrations were probably derived from both Ley Creek as well as on-site sources. A comparison between historical contaminant concentrations in Ley Creek sediments and the concentrations measured under the current investigation indicate that contaminant concentrations in Ley Creek have increased since 1994. This is true even for the sampling location upstream of the site, indicating that an upstream source is contributing to these increases. Since no samples were collected for the current investigation from the on-site swale at the southeastern portion of the site, an evaluation of whether the increase in sediment concentrations in Ley Creek has impacted the concentrations in this swale is not possible. However, since it is believed that contaminant concentrations in this area are influenced by Ley Creek, the concentrations in these on-site swales have also probably increased.

With regard to the ditch running along the northern border of the site, the historical samples show elevated concentrations of metals relative to the historical Ley Creek samples. Due to the proximity of this ditch to the New York State Thruway, it is probable that the metals concentrations in this ditch were derived from both on-site and highway-related sources. When contaminant concentrations in the historical sample (SW/SED-5) collected from this ditch are compared with the contaminant concentrations in the sample collected from the same location for the current study (SW/SED-25), the results indicate that contaminant concentrations have declined significantly in this ditch since 1994, with the exception of cadmium, which was not detected in the historical samples, and sodium. When contaminant concentrations in sediment collected from location SW/SED-25 were compared with concentrations in Ley Creek sediment for the current investigation, the contaminant concentrations in the ditch sample were substantially lower than contaminant concentrations in the Ley Creek samples.

In summary, the drainageways at the southern portion of the site are probably heavily influenced by contaminant concentrations in Ley Creek. In the northern drainageway, contaminant concentrations are probably influenced by both the nearby highway and on-site sources, but contaminant concentrations in this drainageway have decreased substantially since 1994, and they are significantly less than contaminant concentrations in Ley Creek. Abundant and diverse benthic community assemblages are not expected to be present in these drainageways due to the nature of the bottom substrate, and fish that utilize these drainageways are believed to be temporary inhabitants that probably originate from Ley Creek and/or Beartrap Creek. Due to these factors, a quantitative evaluation of the risks associated with the on-site drainageways was not performed under this risk assessment. It is anticipated that conclusions from the risk assessment associated with the on-site terrestrial habitat, as well as conclusions from the risk assessment to be conducted for Ley Creek, will be sufficient to ultimately make risk management decisions related to the on-site drainageways at the Town of Salina landfill.

Based on the survey results, an important terrestrial exposure pathway at the site would be direct exposure of soil invertebrates, such as earthworms, to contaminants in the soil. Since these organisms directly inhabit and ingest site soils, they are expected to be highly exposed to site-related contaminants. Soil invertebrates can be at risk from exposure to toxicants in the soil and may also transfer bioaccumulative contaminants to higher trophic level consumers. Examples of such consumers include invertebrate-feeding birds and mammals, such as the American robin and the short-tailed shrew. By consuming soil invertebrates, birds and mammals would be expected to be exposed to high levels of bioaccumulative site-related contaminants. These intermediate consumers can in turn be consumed by even higher trophic level consumers, such as a raptors and carnivores (e.g., red-tailed hawks, owls, red foxes).

A secondary terrestrial pathway that also exists at the site involves uptake of soil contaminants by grasses and forbs, which are consumed by herbivores (e.g., grasshoppers, meadow voles, white-tailed deer). Contaminants accumulated by these herbivores, particularly small mammals, could then be taken up by upper level consumers. However, this secondary pathway is expected to be less significant because uptake by plants is generally not as significant as uptake by soil invertebrates (USEPA 1999b).

The results of the screening-level risk assessment indicate that a variety of contaminants, including three VOCs, 21 SVOCs, two PCBs, 18 metals, and cyanide could potentially pose a risk to ecological receptors at the site. Depending on the chemistry of the contaminants and the biology of the species found at the Town of Salina Landfill, some species may bioaccumulate contaminants more than others. Species that bioaccumulate contaminants may not themselves exhibit adverse effects from the contaminants, but may pass higher doses off to organisms that consume them. Generally, the higher the trophic level, the more concentrated these bioaccumulative contaminants become in biological tissues due to a process known as biomagnification. At these higher trophic levels, contaminants have a greater potential to reach concentrations that are toxic to the organisms exposed to them. Organisms at these higher trophic levels, therefore, are of particular concern with respect to toxicity from exposure to bioaccumulative contaminants. On the other hand, these higher trophic level receptors are often not exposed to concentrations of contaminants that are non-bioaccumulative direct-acting toxicants, such as VOCs and some SVOCs. Generally, lower trophic level organisms that are in direct contact with contaminated soil, sediment, or surface water are of greater concern with respect to toxicity from these direct-acting toxicants.

Soil invertebrates and the organisms that consume them are considered to be the terrestrial ecological receptors at greatest risk from exposure to contaminants at the site. These organisms represent the direct exposure pathway in soil as well as the transfer of contaminants via the food chain to higher trophic level receptors. Therefore, risks to these receptors were evaluated quantitatively in this risk assessment. Carnivorous wildlife that consume soil invertebrate-feeding organisms can also be at risk from transfer of contaminants higher up the food chain. However, these upper trophic level receptors were observed to be uncommon at the site during the wildlife survey, indicating a limited potential for exposure. This may be due to a limited prey base for these receptors, since a depauperate small mammal community was also observed during the field survey. Furthermore, carnivorous wildlife generally have large home ranges, indicating that the site would provide only a small portion, if any, of the prey consumed by these receptors. Therefore, it was determined that a quantitative evaluation of the risks posed to upper trophic level carnivorous wildlife would not be performed for this risk assessment. Nevertheless, if a risk is calculated to lower level receptors, this would indicate a potentially limited prey base for carnivorous wildlife as well as the ability to transfer bioaccumulative contaminants up the food chain to carnivorous wildlife. Therefore, inferences about the risk to carnivorous wildlife can be made based on the conclusions from this risk assessment about the risk to soil invertebrate-feeding receptors.

7.3.1 Assessment and Measurement Endpoints

The following assessment and measurement endpoints were selected for this risk assessment:

Assessment Endpoint #1: Integrity of the soil invertebrate community

The first assessment endpoint that was evaluated in this risk assessment was the integrity of the soil invertebrate community utilizing the Town of Salina Landfill. Soil invertebrates may be at risk at the site from direct exposure to and ingestion of contaminated soil.

> **Measurement Endpoint for Assessment Endpoint #1:** Comparison of On-Site Soil Contaminant Concentrations to Literature Toxicity Values for Earthworms
>
> The measurement endpoint used to evaluate assessment endpoint #1 was a comparison of measured contaminant concentrations in soil with contaminant concentrations in the literature that have been associated with toxicity to earthworms in the literature. Such literature values have been compiled by Efroymson et al. (1997a). Since these values are based on toxicity tests in which earthworms were exposed to contaminants in soil, they account for both the direct (dermal) and the ingestion pathways, as well as all factors influencing the uptake, metabolism, and disposition of contaminants in earthworms. By comparing soil contaminant concentrations with soil concentrations associated with earthworm toxicity in the literature, a direct evaluation can be made to determine if earthworms inhabiting the soil at the Town of Salina Landfill are exposed to contaminant levels that pose a risk.

Assessment Endpoint #2: Ability of the soil invertebrate community to support higher trophic level populations

The second assessment endpoint that was evaluated in this risk assessment was the ability of the soil invertebrate community to support higher trophic level populations utilizing the Town of Salina Landfill. Soil invertebrates may be at risk at the site from direct exposure to and ingestion of contaminated soil, which may result in a depauperate invertebrate community that may not be able to support higher trophic level populations that rely on them as prey.

Measurement Endpoint for Assessment Endpoint #2: Comparison of On-Site Soil Contaminant Concentrations to Literature Toxicity Values for Earthworms

The measurement endpoint used to evaluate assessment endpoint #2 was a comparison of measured contaminant concentrations in soil with contaminant concentrations in the literature, as described for assessment endpoint #1 above.

Assessment Endpoint #3: Viability of Soil Invertebrate-feeding Avian Populations

The third assessment endpoint that was evaluated in this risk assessment was the viability of soil invertebrate-feeding avian populations. These higher trophic level consumers could be at risk at the Town of Salina Landfill from consumption of contaminants that have accumulated in soil invertebrate tissue.

Measurement Endpoint for Assessment Endpoint #3: Food Chain Model for the American Robin

A food chain model for the American robin (*Turdus migratorius*) was selected as the measurement endpoint to evaluate assessment endpoint #3. The American robin was selected due its likelihood to utilize the Town of Salina Landfill and its position in the terrestrial food chain. As an upper trophic level receptor, the American robin is susceptible to exposure to bioaccumulative contaminants that biomagnify in the food chain. The food chain model predicts the amount of contaminants consumed by the American robin via consumption of soil invertebrates (earthworms), as well as via ingestion of surface water and incidental ingestion of soil. Since American robins were observed at the Town of Salina Landfill on all three days of the ecological survey conducted from July 22 - 24, 1998, this species is known to utilize the site. Since earthworms are the preferred prey of the American robin, it is an appropriate species to represent soil invertebrate-feeding birds.

Information on the life history and exposure profile for the American robin is provided in Appendix E-6 and Table 7-13.

Assessment Endpoint #4: Viability of Soil Invertebrate-feeding Mammal Populations

The final assessment endpoint for this risk assessment is the viability of soil invertebrate-feeding mammal populations. These higher trophic level consumers could be at risk at the Town of Salina Landfill from consumption of contaminants that have accumulated in soil invertebrate tissue.

Measurement Endpoint for Assessment Endpoint #4: Food Chain Model for the Short-tailed Shrew

A food chain model for the short-tailed shrew (*Blarina brevicauda*) was selected as the measurement endpoint to evaluate assessment endpoint #4. The short-tailed shrew is an appropriate measurement endpoint for this risk assessment due to its position in the food chain and its likelihood to be present at the site. As an upper trophic level receptor, the short-tailed shrew is susceptible to exposure to bioaccumulative contaminants that biomagnify in the food chain. The food chain model predicts the amount of contaminants consumed by the short-tailed shrew via consumption of soil invertebrates (earthworms), as well as via ingestion of surface water and incidental ingestion of soil. Since evidence of the presence of small mammals, including short-tailed shrews, was observed at the Town of Salina Landfill during the ecological survey, and since this species is known to occur throughout New York State, the short-tailed shrew is expected to utilize the site. Since earthworms are the preferred prey of the short-tailed shrew, it is an appropriate species to represent soil invertebrate-feeding mammals.

Information on the life history and exposure profile for the short-tailed shrew is provided in Appendix E-6 and Table 7-13.

7.3.2 Derivation of Toxicity Reference Values (TRVs) for the Food Chain Models

Toxicity Reference Values (TRVs) used in the food chain models for this risk assessment are daily dosages of contaminants that are expected to elicit toxic effects in the wildlife receptors of

TABLE 7-13
TOWN OF SALINA LANDFILL
EXPOSURE PARAMETERS FOR THE ECOLOGICAL FOOD CHAIN MODELS

Receptor Species	Body Weight	Food Ingestion Rate	Soil Ingestion Rate	Water Ingestion Rate	Home Range
American Robin	0.0773 kg [a]	1.52 kg/kg-day [b] = 0.117 kg/day	10.4% [c]	0.14 kg/kg-day [d] = 0.0108 L/day	0.11 hectares = 0.275 acres [e]
Short-tailed shrew	0.015 kg [a]	0.62 kg/kg-day [b] = 0.0093 kg/day	13% [f]	0.223 kg/kg-day [d] = 0.003 L/day	0.03 ha = 0.07 acres [e]

[a] Lowest mean adult body weight reported by USEPA (1993).

[b] Largest mean ingestion rate reported by USEPA (1993).

[c] Estimated from the American woodcock in Beyer et al. (1994).

[d] Only one water ingestion rate was reported by USEPA (1993)

[e] Smallest territory size or foraging home range reported by USEPA (1993).

[f] Reported in Talmage and Walton (1993).

concern. TRVs are used to determine whether the calculated daily dosages would result in toxic effects to the selected wildlife receptors. TRVs are derived from dosages that are associated with toxic effects in the literature. Since the assessment endpoints for most ecological risk assessments are concerned with the viability of populations rather than individuals, toxicity endpoints that are associated with adverse effects at the population level are preferred over toxicological effects that are observed at the organ, cellular, biochemical, or molecular level. For the purposes of deriving TRVs for this risk assessment, and in accordance with U.S. EPA's guidance for ecological risk assessment at Superfund Sites (USEPA 1997), endpoints that were considered to be linked to population-level effects included survival, growth, or reproduction. Therefore, if available, studies in which at least one of these effects were measured were used to derive TRVs.

TRVs used in the food chain models are presented as No Observable Adverse Effect Levels (NOAELs) and Lowest Observable Adverse Effect Levels (LOAELs). To derive these values, the lowest daily dosage that has been associated with toxic effects (LOAEL), and the highest dosage that has not been associated with toxic effects (NOAEL) were obtained from the scientific literature. While it is preferable to obtain TRVs from studies in which the wildlife receptors of concern are used as the actual test species, very few such studies exist. Therefore, studies with common laboratory animals (e.g., rats) are often used to derive TRVs. Sample et al. (1996) have conducted a literature review to derive daily dosage TRVs for many contaminants. For some contaminants, the NOAELs and LOAELs derived by Sample et al. (1996) were used. For other contaminants, it was determined that other TRVs developed from the literature were more appropriate. It should be noted that the NOAELs and LOAELs identified by Sample et al. (1996) are provided both as daily dosages in milligrams of contaminant ingested per kilograms of body weight per day (mg/kg BW-day) for the test organisms and as dosages normalized to the body weights of wildlife receptors. To remain consistent with U.S. EPA's guidance for ecological risk assessment at Superfund Sites (USEPA 1997), the dosages for the test organisms were selected as the TRVs for this risk assessment.

In cases where only a LOAEL value was available, the NOAEL value was derived by dividing the LOAEL value by 10, as suggested in the Ecological Risk Assessment Guidance for Superfund (USEPA 1997). This practice is supported by Dourson and Stara (1983), who calculated a LOAEL/NOAEL ratio of five or less for 96% of the toxicity studies they reviewed. Conversely, if only a NOAEL value was available, the LOAEL value was estimated by multiplying the NOAEL value by 10.

In many cases, NOAEL and LOAEL values in the literature are provided as contaminant concentrations in the diet (mg/kg) rather than as daily exposure levels (mg/kg BW-day). Therefore, these values had to be converted to the appropriate units for comparison with the estimated daily exposure levels calculated for the site using the food chain models. To do so, the dietary concentration was multiplied by the food ingestion rate (kg/day) and divided by the body weight (kg) of the test organism. If the body weights and food ingestion rates were provided in the original literature source, then these values were used to make this conversion. In the cases where such information was not provided, the ingestion rates and body weights were obtained from other literature sources. For this risk assessment, many of these ingestion rates and body weights were obtained from Sample et al. (1996).

Information on the toxicity of Aroclor 1248 to birds was not available in the literature. However, information on Aroclor 1254 was available. Since both of these contaminants are PCBs and are of similar composition, the toxicity value for Aroclor 1254 was used to represent the toxicity of Aroclor 1248 to birds.

While studies were available in the literature in which the chronic toxicity of cyanide to birds and mammals was evaluated, these studies reported NOAEL and LOAEL values that were higher than many of the acute oral LD50s reported in the literature. Therefore, these chronic studies were determined to be unsuitable for derivation of the TRV for toxicity of cyanide. Rather, the TRVs were derived by dividing the lowest reported acute oral LD50s by 10 to obtain the LOAELs. These LOAELs were then divided by 10 to obtain the NOAELs.

PAHs were evaluated as a group in the food chain models. Total PAH concentrations were calculated as described in Section 7.4.1. Information on the chronic toxicity of mixtures of PAHs were only available for birds. For mammals, the chronic toxicity of benzo[a]pyrene was used as a conservative estimate of the toxicity of PAHs to mammals.

TRVs for the food chain models were not derived for VOCs and some SVOCs (non-PAHs), since these contaminants are not known to significantly bioaccumulate and biomagnify in the food chain, as discussed previously.

For the COPCs for which TRVs were developed, the studies from which they were derived are listed for each contaminant of potential concern and receptor type in Tables 7-14 and 7-15.

TABLE 7-14
TOWN OF SALINA LANDFILL
DERIVATION OF TOXICITY REFERENCE VALUES FOR BIRDS FOR THE ECOLOGICAL RISK ASSESSMENT

Contaminant	Test Chemical	Test Organism	Study Duration	Test Endpoint	Test Dose or Conc. (1) (mg/kg, unless otherwise noted) NOAEL	Test Dose or Conc. (1) (mg/kg, unless otherwise noted) LOAEL	Body Weight (2) (kg)	Ing. Rate (2) (kg/day)	TRV (mg/kg BW-day) NOAEL	TRV (mg/kg BW-day) LOAEL	Literature Source
Organics											
Total PAHs	PAH mixture	Mallard	7 months	mortality		4000	1	0.1	40	400	Patton and Dieter (1980)
Aroclor 1248	Aroclor 1254	Ring-necked Pheasant	17 wks	reproduction		12.5 mg/bird/wk	1	---	0.18	1.8	Dahlgren et al. (1972) [3]
Inorganics											
Aluminum	Al as $Al_2(SO_4)_3$	White leghorn hens	17 wks	growth, reproduction	1500	3000	1.97	0.115	87.6	175.1	Wisser et al. (1990) [4]
Arsenic	As^{+3} as copper acetoarsenite	Brown-headed cowbird	7 months	mortality	11.09	33.26	0.049	0.01087	2.46	7.38	USFWS (1969) [3]
Barium	Ba as Barium hydroxide	1-day old chicks	4 wks	mortality	200 [5]	400 [5]	0.121	0.0126	20.8	41.7	Johnson et al. (1960) [3]
Beryllium	---	---	---	---	---	---	---	---	---	---	---
Cadmium	Cd as Cadmium chloride	Mallard	90 days	reproduction	15.2	210	1.153	0.11	1.45	20.03	White and Finley (1978) [3]
Chromium	Cr^{+3} as $CrK(SO_4)_2$	Black duck	10 mths	reproduction	---	10	1.25	0.125	0.1	1	Haseltine et al. (unpubl.) [3]
Cobalt	Cobalt	Chicken	acute	growth	---	5 (5)	0.8	0.14	0.0875	0.875	NRC (1977) [6]
Copper	Copper oxide	1-day old chicks	10 wks	growth, mortality	570	749	0.534	0.044	46.97	61.72	Mehring et al. (1960) [3]
Iron	---	---	---	---	---	---	---	---	---	---	---
Lead	Lead acetate	Japanese quail	12 wks	reproduction	10	100	0.15	0.0169	1.13	11.3	Edens et al. (1976) [3]
Manganese	Mn as Mn_3O_4	Japanese quail	75 days	growth	--- [7]	---	--- [7]	--- [7]	977	9770	Laskey and Edens (1985) [3]
Mercury	Methyl mercury dicyandiamide	Japanese quail	3 generations	reproduction		0.5	1	0.128	0.0064	0.064	Heinz (1979) [3]
Nickel	Nickel sulfate	Mallard	90 days	mortality, growth	176	774	0.782	0.0782	17.6	77.4	Cain and Pafford (1981) [3]
Selenium	Selanomethionine	Mallard	100 days	reproduction	4	8	1	0.1	0.4	0.8	Heinz et al. (1989) [3]
Silver	Silver	Turkey	4 wks	growth	---	90 [5]	5	0.166	0.3	3	Peterson et al. (1973) [6]
Thallium	---	---	---	---	---	---	---	---	---	---	---
Vanadium	Vanadyl sulfate	White leghorn hens	28 days	growth, reproduction		20	0.126	1.698	0.15	1.5	Toussant and Latshaw (1994) [8]
Zinc	Zinc sulfate	White leghorn hens	44 wks	reproduction	228	2028	1.935 1.766	0.123 0.114	14.49	130.9	Stahl et al. (1990) [3]
Cyanide	Sodium cyanide	Mallard	single oral dose	mortality		1.43 mg/kg BW [9]	--- [10]	--- [10]	0.0143	0.143	Hill (unpubl.)

(1) These values represent doses or test concentrations as they are reported in the original literature, with exceptions noted. Values in mg/kg are contaminant concentrations in food, and values in mg/L are concentrations in drinking water.

(2) These values were used to convert the NOAEL and LOAEL from dietary concentrations to daily dosages in units of mg/kg BW-day. Body weight and food ingestion values were either reported in the original literature or were obtained from Sample et al. (1996), with the exception of the body weights and food ingestion rates for the chicken and turkey, which were obtained from NIOSH (1986), and the white Leghorn hen (for the aluminum study), which was obtained from Stahl et al. (1990).

(3) Study reported in Sample et al. (1996).

(4) Although a study was reported in Sample et al. (1996), the Wisser et al. (1990) study was found to be more appropriate because it tested 2 doses, identifying both a NOAEL and a LOAEL, whereas the stu reported in Sample et al. (1996) tested only one dose. Both studies were of similar duration and evaluated reproductive endpoints.

(5) The value reported in the literature was divided by an uncertainty factor of 10 to convert from a subchronic to a chronic exposure. The resulting quotient is listed here.

(6) No studies were reported in Sample et al. (1996).

(7) This information was unnecessary because the dosages were reported as mg/kg BW-day in the original literature.

(8) Although a study was reported in Sample et al. (1996), the Toussant and Latshaw (1994) study was found to be more appropriate because it evaluated reproductive and growth endpoints, whereas the stu reported in Sample et al. (1996) evaluated mortality and biochemical indices. In addition, the Toussant and Latshaw (1995) study resulted in a lower NOAEL than that reported in Sample et al. (1996).

(9) The value reported is actually an acute oral LD50. This value was divided by an uncertainty factor of 10 to convert from an LD50 to a chronic LOAEL.

(10) This information was unnecessary because the dosage was reported as mg/kg BW in the original literature.

TABLE 7-15
TOWN OF SALINA LANDFILL
DERIVATION OF TOXICITY REFERENCE VALUES FOR MAMMALS FOR THE ECOLOGICAL RISK ASSESSMENT

Contaminant	Test Chemical	Test Organism	Study Duration	Test Endpoint	Test Dose or Concentration (1) (mg/kg, unless otherwise noted) NOAEL	LOAEL	Body Weight (2) (kg)	Food Ing. Rate (2) (kg/day)	Water Ing. Rate (L/day)	TRV (mg/kg BW-day) NOAEL	LOAEL	Literature Source
Organics												
Total PAHs	Benzo(a)pyrene	Mouse	days 7-16 of gestation	reproduction		10 mg/kg BW/day	--- (4)	--- (4)		1	10	Mackenzie and Angevine (1981)[3]
Aroclor 1248	Aroclor 1248	Rhesus monkey	14 mths	reproduction		2.5	5	0.2		0.01	0.1	Barsotti et al. (1976)[3]
Inorganics												
Aluminum	$AlCl_3$	Mouse	3 generations	reproduction		19.3 mg/kg BW/day	--- (4)	--- (4)		1.93	19.3	Ondreicka et al. (1966)[3]
Arsenic	Arsenite (As^{+3})	Mouse	3 generations	reproduction		5 mg/L (water) + 0.06 mg/kg (food)	0.03	0.0055	0.0075	0.126	1.26	Schroeder and Mitchner (1971)[3]
Barium	Barium chloride	Rat	16 months	growth	100 mg/L		0.435		0.022	5.1	51	Perry et al. (1983)[3]
	Barium chloride	Rat	10 days	mortality		19.8 mg/kg BW/day (5)(6)	--- (4)	--- (4)		1.98	19.8	Borzelleca et al. (1988)[3]
Beryllium	Beryllium Sulfate	Rat	lifetime	mortality, growth	5		0.35	0.046		0.66	6.6	Schroeder and Mitchner (1975)[3]
Cadmium	$CdCl_2$	Rat	6 wks (mating/gestation)	reproduction	1 mg/kg BW/day	10 mg/kg BW/day	--- (4)	--- (4)		1	10	Sutou et al. (1980)[3]
Chromium	Cr^{+3} as Cr_2O_3	Rat	90 days and 2 yrs	repro, survival	34210 (5)		0.35	0.028		2737	27370	Ivankovic and Preussmann (1975)[3]
Cobalt	Cobalt metal powder	Rat	1 month, young rats	mortality		3 mg/rat/day (5)	0.1			3	30	Venugopal and Luckey (1978)[7]
Copper	Copper sulfate	Mink	357 days	reproduction	85.5	110.5	1	0.137		11.71	15.14	Aulerich et al. (1982)[3]
Iron	---	---	---	---	---	---	---	---	---	---	---	---
Lead	Lead Acetate	Rat	3 generations	reproduction	100	1000	0.35	0.028		8	80	Azar et al. (1973)[3]
Manganese	Mn as Mn_3O_4	Rat	224 days (incl. gestation)	reproduction	1100	3550	0.35	0.028		88	284	Laskey et al. (1982)[3]
Mercury	Methyl mercury chloride	Rat	3 generations	reproduction	0.399 (5)	1.997 (5)	0.35	0.028		0.032	0.16	Verschuuren et al. (1976)[3]
Nickel	Nickel sulfate hexahydrate	Rat	3 generations	reproduction	500	1000	0.35	0.028		40	80	Ambrose et al. (1976)[3]
Selenium	Potassium selenate	Rat	1 year (2 gen.'s)	reproduction	1.5 mg/L	2.5 mg/L	0.35		0.046	0.2	0.33	Rosenfeld and Beath (1954)[3]
Silver	Silver	Rat	3 months	liver necrosis		13 (6)	0.35	0.028		0.1	1.0	Bunyan et al. (1968)[7]
Thallium	Thallium sulfate	Rat	60 days	reproduction		1 (6)	0.35	0.028		0.0074	0.074	Formigli et al. (1986)[3]
Vanadium	V as Sodium metavanadate	Rat	60 days (incl. gestation)	reproduction		2.1 (5)	--- (4)	--- (4)		0.21	2.1	Domingo et al. (1986)[3]
Zinc	Zinc oxide	Rat	days 1-16 of gestation	reproduction	2000	4000	0.35	0.028		160	320	Schlicker and Cox (1968)[3]
Cyanide	Potassium cyanide	Rat	gestation & lactation	reproduction		2.3 (8)	--- (9)	--- (9)		0.023	0.23	Ballantyne (1987)[10]

(1) These values represent doses or test concentrations as they are reported in the original literature, with exceptions noted. Values in mg/kg are contaminant concentrations in food, and values in mg/L are concentrations in drinking water.
(2) These values were used to convert the NOAEL and LOAEL from dietary concentrations to daily dosages in units of mg/kg BW-day. Body weight and food ingestion values were either reported in the original literature or were obtained from Sample et al. (1996), with the exception of the body weight for young rats (0.1 kg), which was estimated based on the body weight for adults (0.2 kg) and the body weight for weanlings (0.05 kg) listed in NIOSH (1986).
(3) Study reported in Sample et al. (1996).
(4) This information was unnecessary because the dosages were reported as mg/kg BW-day in the original literature.
(5) The value in the literature was expressed as the concentration of the test chemical. This value was adjusted by the mass fraction of elemental metal or ion in the test chemical to obtain the NOAEL or LOAEL.
(6) The value reported in the literature was divided by an uncertainty factor of 10 to convert from a subchronic to a chronic exposure. The resulting quotient is listed here.
(7) No studies were reported in Sample et al. (1996).
(8) The value reported is actually an acute oral LD50. This value was divided by an uncertainty factor of 10 to convert from an LD50 to a chronic LOAEL.
(9) This information was unnecessary because the dosage was reported as mg/kg BW in the original literature.
(10) Although a study was reported in Sample et al. (1996), the Ballantyne (1987) study was determined to be more appropriate because it resulted in an acute oral LD50 that was lower than the NOAEL provided in Sample et al. (1996).

7.4 RISK CHARACTERIZATION

7.4.1 Treatment of the Data

Since this risk assessment only evaluated the risks associated with the terrestrial pathway at the Town of Salina Landfill, the only data that were used for the definitive risk characterization were from soil, surface water, and earthworm tissue. Data from sediment or leachate were not utilized beyond the screening level risk assessment. The soil data were used for the comparisons with literature toxicity values for earthworms and in the food chain models to calculate exposure to upper trophic level ecological receptors from incidental ingestion of surface soil. Surface water data were used to calculate exposure of these receptors from drinking water, and earthworms were used to calculate exposure from prey. If a contaminant was detected in at least one sample of a particular media, then for other samples in that media for which it was not detected, its concentration was assumed to be one-half of its detection limit in that sample. For all other contaminants (contaminants that were detected in at least one sample of a particular media), in order to calculate the mean concentrations, if a contaminant was not detected in a sample, its concentration was assumed to be one-half of its detection limit in that sample. Soil samples SS-40 and SS-41 and surface water sample SW-20 were not included in the analysis as these samples were collected off-site or upstream and were intended to represent background contaminant concentrations.

The soil contaminant concentrations listed in Table and 7-8 are reported as dry weight concentrations. These soil concentrations needed to be converted to wet weight concentrations for use in the food chain models, since the TRVs derived from the literature are expressed as wet weight dosages. In order to convert to wet weight concentrations, the dry weight concentration of each contaminant in each sample was multiplied by the percent solids value for that sample. The resulting summary statistics for the wet weight concentrations are provided in Table 7-16 and were used in the food chain models to estimate exposure to ecological receptors via incidental ingestion of surface soil.

Earthworms were collected from the Town of Salina Landfill, as discussed in Section 2.5.6. The resulting tissue contaminant concentrations were used as the source of contaminants from prey for the upper trophic level receptors evaluated in this risk assessment. As discussed previously, a limited number of earthworms were found at the site during the sampling effort, most likely due to the severe drought conditions in the region before and during the sampling event. Because there was not enough mass to analyze each location-specific sample, the samples were

TABLE 7-16
TOWN OF SALINA LANDFILL
SOIL SUMMARY STATISTICS FOR THE ECOLOGICAL RISK ASSESSMENT
(WET WEIGHT CONCENTRATIONS)

ANALYTE	Number of Times Detected	Total Number of Samples	Detection Frequency	Minimum Concentration		Maximum Concentration	Mean Concentration
VOCs (ug/kg)							
Bromoform	7	7	100%	9.58		10.42	9.97
Methylene chloride	2	7	29%	0.91	(1)	0.96	3.85
SVOCs (ug/kg)							
1,4-Dichlorobenzene	2	27	7%	42.32	(1)	43.24	340
2-Methylnaphthalene	11	27	41%	44.16	(1)	508	389
4-Chloroaniline	5	27	19%	69.00	(1)	189	330
Acenaphthene	16	27	59%	57.95	(1)	930	379
Acenaphthylene	17	27	63%	40.40	(1)	1633	444
Anthracene	22	27	81%	40.40	(1)	2325	622
Benzo(a)anthracene	25	27	93%	34.72	(1)	8184	1841
Benzo(a)pyrene	25	27	93%	34.72	(1)	8091	1741
Benzo(b)fluoranthene	24	27	89%	52.08	(1)	12607	2895
Benzo(ghi)perylene	24	27	89%	38.32	(1)	4836	1451
Benzo(k)fluoranthene	25	27	93%	67.06	(1)	3356	767
Bis(2-ethylhexyl) phthalate	5	27	19%	34.72	(1)	1099	512
Carbazole	17	27	63%	45.12	(1)	651	287
Chrysene	26	27	96%	43.40	(1)	8463	2091
Dibenzo(a,h)anthracene	17	27	63%	92.07	(1)	884	455
Dibenzofuran	14	27	52%	45.12	(1)	3356	425
Fluoranthene	27	27	100%	38.54		16326	3720
Fluorene	18	27	67%	33.84	(1)	998	357
Hexachlorobenzene	2	27	7%	105	(1)	117	338
Indeno(1,2,3-cd)pyrene	23	27	85%	67.06	(1)	4650	1434
Naphthalene	13	27	48%	47.50	(1)	623	399
Phenanthrene	26	27	96%	43.40	(1)	13020	2751
Pyrene	27	27	100%	41.36		14880	4299
Total PAHs	27	27	100%	2574		98171	26513
PEST/PCBs (ug/kg)							
4,4'-DDD	3	27	11%	6.28	(1)	24.49	17.70
4,4'-DDE	3	27	11%	1.54	(1)	13.65	16.54
4,4'-DDT	4	27	15%	0.56	(1)	18.36	17.16
Aldrin	2	27	7%	1.29	(1)	1.63	8.44
alpha-Chlordane	2	27	7%	4.04	(1)	6.26	8.71
beta-BHC	3	27	11%	1.91	(1)	2.45	8.54
delta-BHC	2	27	7%	0.28	(1)	0.82	8.37
gamma-BHC (Lindane)	2	27	7%	0.61	(1)	0.64	8.37
Dieldrin	4	27	15%	0.43	(1)	6.17	16.32
Endrin aldehyde	3	27	11%	0.56	(1)	12.70	16.82
Endrin ketone	3	27	11%	3.19	(1)	31.75	17.93
gamma-Chlordane	3	27	11%	0.66	(1)	7.17	8.82
Methoxychlor	3	27	11%	2.46	(1)	15.42	83.73
Aroclor-1248	2	27	7%	190.96	(1)	6787.20	419.45
INORGANICS (mg/kg)							
Aluminum	27	27	100%	4798.80		11830.00	7211.46
Arsenic	8	27	30%	2.39	(1)	6.35	1.98
Barium	27	27	100%	30.82		487.60	105.89
Beryllium	7	27	26%	0.33	(1)	0.44	0.32
Cadmium	27	27	100%	1.03		15.69	5.87
Calcium	27	27	100%	6585.60		107933.00	42457.32
Chromium	27	27	100%	10.27		109.04	43.16
Cobalt	26	27	96%	4.46	(1)	14.32	6.79
Copper	27	27	100%	16.69		694.56	80.50
Iron	27	27	100%	4416.00		18216.00	13547.98
Lead	27	27	100%	7.92		1009.66	132.14
Magnesium	27	27	100%	3436.80		25380.00	12959.11
Manganese	27	27	100%	256.62		506.87	346.44
Mercury	18	27	67%	0.21	(1)	2.36	0.58
Nickel	27	27	100%	10.46		66.50	30.65
Potassium	27	27	100%	518.01		2492.90	1140.76
Selenium	20	27	74%	4.42	(1)	21.43	10.89
Silver	13	27	48%	0.64	(1)	7.36	2.50
Sodium	7	27	26%	603.33	(1)	822.92	254.12
Thallium	10	27	37%	2.23	(1)	3.42	1.55
Vanadium	25	27	93%	11.19	(1)	20.61	14.47
Zinc	27	27	100%	37.82		1399.94	194.19
Cyanide	6	27	22%	0.57	(1)	3.10	0.96

(1) Minimum value was actually non-detect. Value shown is the minimum of the samples in which the contaminant was detected.

composited into one sample to obtain enough mass for analysis. Even after having composited the sample, there still was not sufficient mass to perform the percent moisture analysis. Percent moisture information is necessary in order to convert the tissue contaminant concentrations from dry weight to wet weight concentrations for the food chain models. Since site-specific percent moisture data was not available, an average percent moisture value of 83.7% for earthworms was obtained from a previous study (USEPA 1999c) and used to covert the earthworm tissue concentrations to wet weight. Since only one (composite) sample was analyzed, no summary statistics were necessary for the earthworm data. The earthworm data, in wet weight and dry weight, are presented in Table 7-17.

Finally, since TRVs were seldom available for individual PAHs, total PAH concentrations were also calculated and evaluated in this risk assessment. To calculate total PAH concentrations, if a PAH was not detected in any sample of a particular media, then that PAH was not included in the sum of the total PAHs for that media. If a PAH was detected in a particular media but was not detected in every sample, its concentration was assumed to be one-half its detection limit for those samples in which it was not detected in that media. Using these assumptions, the concentrations of each individual PAH were summed to obtain a total PAH concentration for each sample. The mean and maximum concentrations of total PAHs for each media were calculated from these total PAH values for each sample.

7.4.2 Risk Calculations

To calculate the risk to soil invertebrates from contaminants at the Town of Salina Landfill, both the maximum and the mean contaminant concentrations measured in surface soil samples collected from the site were divided by the toxicity values for earthworms obtained from Efroymson et al. (1997a). The resulting hazard quotients (HQs) were used to determine the potential for risk from contaminants to earthworms inhabiting the soil at the site. In this evaluation, if an HQ using the mean was greater than one for a contaminant, then that contaminant was determined to pose a risk to earthworms.

To calculate the risk to soil invertebrate-feeding birds and mammals from contaminants, estimated daily dosages of each contaminant for each receptor were compared to the TRVs for each contaminant. To calculate the estimated contaminant daily dosages for the selected ecological receptors (American robin and short-tailed shrew), a food chain model for each receptor was developed. The food chain models are summarized by the following equation:

TABLE 7-17
TOWN OF SALINA LANDFILL
RESULTS OF THE EARTHWORM ANALYSIS FOR THE ECOLOGICAL RISK ASSESSMENT

ANALYTE	Dry Weight Concentration	Estimated Wet Weight Concentration*
SVOCs (ug/kg)		
4-Methylphenol	1100	179
Di-n-butyl phthalate	170	27.7
INORGANICS (mg/kg)		
Aluminum	26.4	4.3
Arsenic	2.2	0.36
Cadmium	6.7	1.1
Calcium	734	120
Copper	4.9	0.80
Iron	144	23.5
Lead	4.3	0.70
Manganese	7.2	1.2
Mercury	0.28	0.05
Potassium	843	137
Selenium	4.0	0.65
Sodium	618	101
Zinc	50.8	8.3

* Wet weight concentrations are based on an average moisture content of 83.7% for earthworms based on data presented in U.S. EPA (1999c).

$$\text{Daily Dosage} = \frac{[(FI \times C_{earthworms}) + (SI \times C_{soil}) + (WI \times C_{water}] \times AUF}{BW}$$

where:

FI = Food ingestion rate (kg/day)
SI = Incidental soil ingestion rate (kg/day)
WI = Surface water ingestion rate (L/day)
$C_{earthworms}$ = Contaminant concentration in earthworms (mg/kg, ww)
C_{soil} = Contaminant concentration in surface soil (mg/kg, ww)
C_{water} = Contaminant concentration in surface water (mg/L)
AUF = Area use factor (no units)
BW = Body weight (kg)

The maximum concentration of each contaminant in surface water, surface soil, and earthworm tissue as well as the water, soil, and food ingestion rates, body weights, and area use factors (AUFs) were entered into the food chain models. The ingestion rates and body weights are identified in Table 7-13 for each receptor. The AUF for both receptors was determined to be one, since the minimum home range in each case (see Table 7-13) was less than the approximate 55 acre area of the site. Using the food chain models, the ingestion rates for each media (surface water, surface soil, and earthworms) were first multiplied by the maximum contaminant concentrations for each media. The resulting contaminant dosages for each media and food type were then summed, multiplied by the area use factor (AUF), and divided by the body weight of the receptor to obtain a daily dosage of each contaminant in units of mg/kg BW-day for each receptor. The resulting daily dosages were then divided by the TRVs for each contaminant to obtain a hazard quotient (HQ). If a hazard quotient was greater than one using the maximum concentration of a contaminant, then that contaminant poses a risk to that receptor at the most contaminated locations at the site, and the mean concentrations of that contaminant were also entered into the food chain model to obtain a more realistic average exposure dosage for the receptor. If an HQ was still greater than one for a receptor using the mean contaminant concentrations, then that contaminant was determined to pose a risk to that receptor site-wide.

7.4.3 Results

7.4.3.1 Comparison of Soil Concentrations with Toxicity Values for Earthworms

The results of the comparisons between maximum and mean soil contaminant concentrations and earthworm toxicity reference values are provided in Table 7-18. A number of contaminants exceeded the toxicity values using the maximum concentrations. These included total PAHs, chromium, copper, lead, mercury, and zinc. Therefore, a risk to soil invertebrates exists from these contaminants at the most highly contaminated locations. However, assessment endpoint #'s 1 and 2 are aimed at the site-wide integrity of the invertebrate community and the site-wide ability of the invertebrate community to sustain higher trophic level populations. Therefore, the comparisons between mean soil contaminant concentrations with the earthworm toxicity values were also reviewed. Using the mean contaminant concentrations, only chromium, copper, mercury, and zinc had hazard quotients greater than one, indicating that these metals pose a risk to both the integrity of the soil invertebrate community and the ability of the soil invertebrate community to support higher trophic level populations the site. These hazard quotients using the mean concentrations ranged from a high of 118 for chromium to a low of 1.1 for zinc.

It should be noted that toxicity values for earthworms were not available for many of the COPCs detected in soil (Efroymson et al. 1997a). These COPCs included bromoform, 18 PAHs, 4-chloroaniline, bis(2-ethylhexyl)phthalate, aluminum, barium, beryllium, cobalt, iron, manganese, silver, thallium, vanadium, and cyanide. The PAHs were evaluated by summing PAH concentrations in each sample and comparing the resulting total PAH concentrations to the earthworm toxicity value for fluorene. However, the risk to soil invertebrates posed by the remaining contaminants that do not have toxicity values is uncertain.

7.4.3.2 Food Chain Model for Soil Invertebrate-Feeding Birds (American robin)

The results of the food chain model and hazard quotient calculations for the American robin are provided in Table 7-19. The results and conclusions based on this food chain model are summarized below.

Using the maximum contaminant concentrations, the results of the food chain model for the American robin indicate that aluminum, barium, cadmium, chromium, cobalt, copper, lead, mercury, selenium, silver, vanadium, zinc, and cyanide pose a potential threat to soil

TABLE 7-18
TOWN OF SALINA LANDFILL
HAZARD CHARACTERIZATION FOR SOIL INVERTEBRATES

ANALYTE		Earthworm TRV [1]	Soil Concentrations (dry weight) Maximum	Mean	Hazard Quotients Maximum	Mean
VOCs		(mg/kg, dw)	(mg/kg, dw)	(mg/kg, dw)		
	Acetone	---	ND	ND	ND	ND
	Bromoform	---	12	11.14	---	---
	Chlorobenzene	40	ND	ND	ND	ND
SVOCs						
	2-Methylnaphthalene	---	540	424	---	---
	4-Chloroaniline	---	210	360	---	---
	Acenaphthene	---	1000	412	---	---
	Acenaphthylene	---	1800	482	---	---
	Anthracene	---	2500	673	---	---
	Benzo(a)anthracene	---	8800	1988	---	---
	Benzo(a)pyrene	---	8700	1879	---	---
	Benzo(b)fluoranthene	---	13900	3131	---	---
	Benzo(g,h,i)perylene	---	5200	1565	---	---
	Benzo(k)fluoranthene	---	3700	831	---	---
	bis(2-Ethylhexyl)phthalate	---	1360	560	---	---
	Carbazole	---	700	313	---	---
	Chrysene	---	9100	2259	---	---
	Dibenzo(a,h)anthracene	---	960	494	---	---
	Dibenzofuran	---	3700	465	---	---
	Fluoranthene	---	18000	4021	---	---
	Fluorene	30000	1100	387	0.04	0.01
	Indeno(1,2,3-cd)pyrene	---	5000	1549	---	---
	Napthalene	---	670	434	---	---
	Phenanthrene	---	14000	2969	---	---
	Pyrene	---	16000	4638	---	---
	Total PAHs	30000 (2)	105560	28660	**3.52**	0.96
PCBs						
	Aroclor 1248	---	8400	492	---	---
	Aroclor 1260	---	ND	ND	ND	ND
INORGANICS						
	Aluminum	---	13000	7834	---	---
	Arsenic	60	7.00	2.18	0.12	0.04
	Barium	---	530	115	---	---
	Beryllium	---	0.48	0.35	---	---
	Cadmium	20	17.3	6.43	0.87	0.32
	Chromium	0.4	127.1	47	**317.75**	**117.97**
	Cobalt	---	16.5	7.36	---	---
	Copper	50	859.6	91	**17.19**	**1.82**
	Iron	---	19800	14698	---	---
	Lead	500	1163.2	146	**2.33**	0.29
	Manganese	---	557	375	---	---
	Mercury	0.1	2.60	0.63	**26.00**	**6.33**
	Nickel	200	82.3	33	0.41	0.17
	Selenium	70	22.8	12	0.33	0.17
	Silver	---	8.00	2.70	---	---
	Thallium	---	3.60	1.67	---	---
	Vanadium	---	22.4	16	---	---
	Zinc	200	1732.6	219	**8.66**	**1.10**
	Cyanide	---	3.30	1.03	---	---

N/A = Not applicable because compound was not detected in soil.
ND = Not Detected in Soil

(1) Efroymson et al. (1997a)
(2) Value is actually the TRV for fluorene.

TABLE 7-19
TOWN OF SALINA LANDFILL
FOOD CHAIN MODEL AND HAZARD QUOTIENTS FOR THE AMERICAN ROBIN

Maximum Contaminant Concentrations:

Contaminant	Earthworm Conc.	Soil Max Conc.	Water Max. Conc.	Food Ing. Rate (kg/day)	Soil Ing. Rate (kg/day)	Water Ing. Rate (L/day)	Body Weight (kg)	Area Use Factor	Calculated Dose (mg/kg BW-day, ww)	NOAEL (mg/kg BW-day, ww)	LOAEL (mg/kg BW-day, ww)	HQ NOAEL	HQ LOAEL
Pesticides/PCBs	(ug/kg, ww)	(ug/kg, ww)	(ug/L)										
Total PAHs	ND	98170.8	10	0.117	0.012	0.0108	0.0773	1	0.00140	40	400	0.000035	0.000003
Aroclor 1248	ND	6787	0.14	0.117	0.012	0.0108	0.0773	1	0.00002	0.18	1.8	0.0001	0.00001
Inorganics	(mg/kg, ww)	(mg/kg, ww)	(ug/L)										
Aluminum	4.3	11830	238	0.117	0.012	0.0108	0.0773	1	1843	87.6	175.1	**21.0**	**10.5**
Arsenic	0.36	6.35	ND	0.117	0.012	0.0108	0.0773	1	1.53	2.46	7.38	0.62	0.21
Barium	ND	488	77.8	0.117	0.012	0.0108	0.0773	1	75.7	20.8	41.7	**3.64**	**1.82**
Beryllium	ND	0.44	ND	0.117	0.012	0.0108	0.0773	1	0.07	---	---	---	---
Cadmium	1.1	15.69	ND	0.117	0.012	0.0108	0.0773	1	4.10	1.45	20	**2.83**	0.205
Chromium	ND	109	2.29	0.117	0.012	0.0108	0.0773	1	16.9	0.1	1	**169**	**16.9**
Cobalt	ND	14.32	ND	0.117	0.012	0.0108	0.0773	1	2.22	0.0875	0.875	**25.4**	**2.54**
Copper	0.8	695	12.7	0.117	0.012	0.0108	0.0773	1	109	47	61.7	**2.32**	**1.77**
Iron	23.5	18216	702	0.117	0.012	0.0108	0.0773	1	2864	---	---	---	---
Lead	0.7	1010	5.6	0.117	0.012	0.0108	0.0773	1	158	1.13	11.3	**140**	**14.0**
Manganese	1.2	507	217	0.117	0.012	0.0108	0.0773	1	80.5	977	9770	0.082	0.0082
Mercury	0.05	2.36	ND	0.117	0.012	0.0108	0.0773	1	0.44	0.0064	0.064	**69.07**	**6.91**
Nickel	ND	66.5	2.96	0.117	0.012	0.0108	0.0773	1	10.3	17.6	77.4	0.59	0.13
Selenium	0.65	21.43	ND	0.117	0.012	0.0108	0.0773	1	4.31	0.4	0.8	**10.8**	**5.39**
Silver	ND	7.36	ND	0.117	0.012	0.0108	0.0773	1	1.14	0.3	3	**3.81**	0.38
Thallium	ND	3.42	ND	0.117	0.012	0.0108	0.0773	1	0.53	---	---	---	---
Vanadium	ND	20.6	1.8	0.117	0.012	0.0108	0.0773	1	3.20	0.15	1.5	**21.3**	**2.13**
Zinc	8.3	1400	53.1	0.117	0.012	0.0108	0.0773	1	230	14.5	131	**15.9**	**1.76**
Cyanide	ND	3.1	18.6	0.117	0.012	0.0108	0.0773	1	0.48	0.0143	0.143	**33.8**	**3.38**

Mean Contaminant Concentrations:

Contaminant	Earthworm Conc.	Soil Mean Conc.	Water Mean Conc.	Food Ing. Rate (kg/day)	Soil Ing. Rate (kg/day)	Water Ing. Rate (L/day)	Body Weight (kg)	Area Use Factor	Calculated Dose (mg/kg BW-day, ww)	NOAEL (mg/kg BW-day, ww)	LOAEL (mg/kg BW-day, ww)	HQ NOAEL	HQ LOAEL
Inorganics	(mg/kg, ww)	(mg/kg, ww)	(ug/L)										
Aluminum	4.3	7211	194	0.117	0.012	0.0108	0.0773	1	1126	87.6	175.1	**12.85**	**6.43**
Barium	ND	106	68.1	0.117	0.012	0.0108	0.0773	1	16.4	20.8	41.7	0.791	0.394
Cadmium	1.1	5.87	ND	0.117	0.012	0.0108	0.0773	1	2.58	1.45	20	**1.777**	0.129
Chromium	ND	43.2	1.2	0.117	0.012	0.0108	0.0773	1	6.70	0.1	1	**67.00**	**6.70**
Cobalt	ND	6.79	ND	0.117	0.012	0.0108	0.0773	1	1.05	0.0875	0.875	**12.05**	**1.20**
Copper	0.8	80.5	8.4	0.117	0.012	0.0108	0.0773	1	13.7	47	61.7	0.292	0.222
Lead	0.7	132	3.8	0.117	0.012	0.0108	0.0773	1	21.6	1.13	11.3	**19.09**	**1.91**
Mercury	0.05	0.58	ND	0.117	0.012	0.0108	0.0773	1	0.17	0.0064	0.064	**26.01**	**2.60**
Selenium	0.65	10.9	ND	0.117	0.012	0.0108	0.0773	1	2.67	0.4	0.8	**6.69**	**3.34**
Silver	ND	2.50	ND	0.117	0.012	0.0108	0.0773	1	0.39	0.3	3	**1.29**	0.129
Vanadium	ND	14.5	1.2	0.117	0.012	0.0108	0.0773	1	2.25	0.15	1.5	**14.98**	**1.50**
Zinc	8.3	194	29.8	0.117	0.012	0.0108	0.0773	1	42.7	14.5	131	**2.95**	0.326
Cyanide	ND	0.96	11.16	0.117	0.012	0.0108	0.0773	1	0.15	0.0143	0.143	**10.48**	**1.048**

ND = Not Detected

invertebrate-feeding birds at the Town of Salina Landfill. However, for cadmium and silver, the hazard quotients exceeded one using only the NOAELs, not the LOAELs. This indicates that, if the robin is feeding and drinking in the most contaminated areas 100% of the time, the estimated daily dosage of these contaminants could be at a level that may produce toxic effects to the bird population, but no studies have yet proven toxic effects at these dosages. For aluminum, barium, chromium, cobalt, copper, lead, mercury, selenium, vanadium, zinc, and cyanide, the hazard quotients were greater than one using both the NOAELs and the LOAELs, indicating that if the robin is feeding and drinking in the most contaminated areas 100% of the time, the estimated daily dosages of these contaminants are at a level that has been shown to produce toxic effects that could affect soil invertebrate-feeding bird populations.

For the contaminants identified as posing a potential risk using the maximum concentrations, the mean concentrations were also entered into the food chain model to obtain a more realistic estimated daily dosage of these contaminants to the American robin at the site. As a result, the hazard quotients for aluminum, cadmium, chromium, cobalt, lead, mercury, selenium, silver, vanadium, zinc, and cyanide were greater than one. For cadmium, silver, and zinc, the hazard quotients were greater than one using only the NOAEL, indicating the potential for adverse effects, but no studies have yet proven toxic effects at these dosages. These hazard quotients were 1.8, 1.29, and 2.95, respectively. For aluminum, chromium, cobalt, lead, mercury, selenium, vanadium, and cyanide, the hazard quotients exceeded one using both the NOAELs and LOAELs, indicating that soil invertebrate-feeding birds are likely to be at risk from these contaminants at the site. Of these contaminants, the greatest hazard quotient was calculated for chromium (HQs of 67 and 6.7 using the NOAEL and LOAEL, respectively), followed in decreasing order by mercury, lead, vanadium, aluminum, cobalt, cyanide, and selenium.

It should be noted that TRVs for the American robin could not be derived for beryllium, iron, or thallium because there was not enough information available in the literature on the toxicity of these three metals to birds. Therefore, the potential risk posed by these three metals to soil invertebrate-feeding birds at the landfill is uncertain. Finally, although Aroclor 1260 was identified as a COPC in this risk assessment, it was not detected in earthworm tissue, surface water, or surface soil; therefore, it was not evaluated in the food chain model for the American robin and it is not expected to pose a risk to soil invertebrate-feeding birds.

7.4.3.3 Food Chain Model for Soil Invertebrate-Feeding Mammals (Short-tailed shrew)

The results of the food chain model and hazard quotient calculations for the short-tailed shrew are provided in Table 7-20. The results and conclusions based on this food chain model are summarized below.

Using the maximum contaminant concentrations, the results of the food chain model for the short-tailed shrew indicate that the hazard quotients for aluminum, arsenic, barium, cadmium, copper, lead, mercury, selenium, silver, thallium, vanadium, and cyanide are greater than one. However, for arsenic, cadmium, lead, silver, vanadium, and cyanide, the hazard quotients exceeded one using only the NOAELs, not the LOAELs. This indicates that, if the shrew is feeding and drinking in the most contaminated areas 100% of the time, the estimated daily dosage of these contaminants could be at a level that may produce toxic effects to the population, but no studies have yet proven toxic effects at these dosages. For aluminum, barium, copper, mercury, selenium, and thallium, the hazard quotients were greater than one using both the NOAELs and the LOAELs, indicating that if the shrew is feeding and drinking in the most contaminated areas 100% of the time, the daily dosages of these contaminants may reach a level that has been shown to produce toxic effects to soil invertebrate-feeding mammals at the population level.

For the contaminants identified as posing a potential risk using the maximum concentrations, the mean concentrations were also entered into the food chain model to obtain a more realistic estimated daily dosage of these contaminants to the short-tailed shrew. As a result, the hazard quotients for aluminum, arsenic, barium, cadmium, lead, mercury, selenium, silver, thallium, vanadium and cyanide were greater than one. For arsenic, barium, cadmium, lead, mercury, silver, vanadium, and cyanide, the hazard quotients were greater than one using only the NOAEL, indicating the potential for adverse effects, but no studies have yet proven toxic effects at these dosages. For aluminum, selenium, and thallium, the hazard quotients exceeded one using both the NOAELs and LOAELs, indicating that soil invertebrate-feeding mammals are likely to be at risk from these contaminants at the site. Of these contaminants, the greatest hazard quotients were calculated for aluminum (HQs of 259 and 26 using the NOAEL and LOAEL, respectively). In comparison, the calculated hazard quotients for selenium were 5.8 and 3.5 using the NOAEL and LOAEL, respectively, and the HQs for thallium were 14.4 and 1.4 using the NOAEL and LOAEL, respectively.

TABLE 7-20
TOWN OF SALINA LANDFILL
FOOD CHAIN MODEL AND HAZARD QUOTIENTS FOR THE SHORT-TAILED SHREW

Maximum Contaminant Concentrations:

Contaminant	Earthworm Conc.	Soil Max Conc.	Water Max. Conc.	Food Ing. Rate (kg/day)	Soil Ing. Rate (kg/day)	Water Ing. Rate (L/day)	Body Weight (kg)	Area Use Factor	Calculated Dose (mg/kg BW-day, ww)	NOAEL (mg/kg BW-day, ww)	LOAEL (mg/kg BW-day, ww)	HQ NOAEL	HQ LOAEL
Pesticides/PCBs	(ug/kg, ww)	(ug/kg, ww)	(ug/L)										
Total PAHs	ND	98171	10	0.0093	0.001034	0.003	0.015	1	0.00200	1	10	0.002	0.0002
Aroclor 1248	ND	6787	0.14	0.0093	0.001034	0.003	0.015	1	0.00003	0.01	0.1	0.003	0.0003
Inorganics	(mg/kg, ww)	(mg/kg, ww)	(ug/L)										
Aluminum	4.3	11830	238	0.0093	0.001034	0.003	0.015	1	818	1.93	19.3	**423.7**	**42.37**
Arsenic	0.36	6.35	ND	0.0093	0.001034	0.003	0.015	1	0.7	0.126	1.26	**5.24**	0.52
Barium	ND	488	77.8	0.0093	0.001034	0.003	0.015	1	33.6	5.1	19.8	**6.59**	**1.70**
Beryllium	ND	0.44	ND	0.0093	0.001034	0.003	0.015	1	0.03	0.66	6.6	0.045	0.0045
Cadmium	1.1	15.7	ND	0.0093	0.001034	0.003	0.015	1	1.8	1.0	10	**1.76**	0.176
Chromium	ND	109	2.29	0.0093	0.001034	0.003	0.015	1	7.5	2737	27370	0.0027	0.00027
Cobalt	ND	14.3	ND	0.0093	0.001034	0.003	0.015	1	1.0	3	30	0.33	0.033
Copper	0.8	695	12.7	0.0093	0.001034	0.003	0.015	1	48.4	11.7	15.1	**4.14**	**3.20**
Iron	23.5	18216	702	0.0093	0.001034	0.003	0.015	1	1270	—	—	---	---
Lead	0.7	1010	5.6	0.0093	0.001034	0.003	0.015	1	70	8.0	80	**8.75**	0.875
Manganese	1.2	507	217	0.0093	0.001034	0.003	0.015	1	35.7	88	284	0.41	0.126
Mercury	0.05	2.36	ND	0.0093	0.001034	0.003	0.015	1	0.2	0.032	0.16	**6.05**	**1.210**
Nickel	ND	66.5	2.96	0.0093	0.001034	0.003	0.015	1	4.6	40	80	0.115	0.057
Selenium	0.65	21.4	ND	0.0093	0.001034	0.003	0.015	1	1.9	0.2	0.33	**9.39**	**5.69**
Silver	ND	7.36	ND	0.0093	0.001034	0.003	0.015	1	0.5	0.1	1.0	**5.07**	0.507
Thallium	ND	3.42	ND	0.0093	0.001034	0.003	0.015	1	0.24	0.0074	0.074	**31.84**	**3.18**
Vanadium	ND	20.6	1.8	0.0093	0.001034	0.003	0.015	1	1.4	0.21	2.1	**6.76**	0.676
Zinc	8.3	1400	53.1	0.0093	0.001034	0.003	0.015	1	102	160	320	0.64	0.32
Cyanide	ND	3.1	18.6	0.0093	0.001034	0.003	0.015	1	0.2	0.023	0.23	**9.45**	0.945

Mean Contaminant Concentrations:

Contaminant	Earthworm Conc.	Soil Mean Conc.	Water Mean Conc.	Food Ing. Rate (kg/day)	Soil Ing. Rate (kg/day)	Water Ing. Rate (L/day)	Body Weight (kg)	Area Use Factor	Calculated Dose (mg/kg BW-day, ww)	NOAEL (mg/kg BW-day, ww)	LOAEL (mg/kg BW-day, ww)	HQ NOAEL	HQ LOAEL
Inorganics	(mg/kg, ww)	(mg/kg, ww)	(ug/L)										
Aluminum	4.3	7211	194	0.0093	0.001034	0.003	0.015	1	500	1.93	19.3	**258.83**	**25.88**
Arsenic	0.36	1.98	ND	0.0093	0.001034	0.003	0.015	1	0.36	0.126	1.26	**2.85**	0.29
Barium	ND	106	68.1	0.0093	0.001034	0.003	0.015	1	7.31	5.1	19.8	**1.43**	0.37
Cadmium	1.1	5.87	ND	0.0093	0.001034	0.003	0.015	1	1.09	1.0	10	**1.09**	0.11
Copper	0.8	80.50	8.4	0.0093	0.001034	0.003	0.015	1	6	11.7	15.1	0.52	0.40
Lead	0.7	132	3.8	0.0093	0.001034	0.003	0.015	1	9.54	8.0	80	**1.19**	0.12
Mercury	0.05	0.58	ND	0.0093	0.001034	0.003	0.015	1	0.07	0.032	0.16	**2.23**	0.45
Selenium	0.65	10.89	ND	0.0093	0.001034	0.003	0.015	1	1.15	0.2	0.33	**5.77**	**3.49**
Silver	ND	2.50	ND	0.0093	0.001034	0.003	0.015	1	0.17	0.1	1.0	**1.72**	0.17
Thallium	ND	1.55	ND	0.0093	0.001034	0.003	0.015	1	0.11	0.0074	0.074	**14.43**	**1.44**
Vanadium	ND	14.47	1.2	0.0093	0.001034	0.003	0.015	1	1.00	0.21	2.1	**4.75**	0.47
Cyanide	ND	0.96	11.16	0.0093	0.001034	0.003	0.015	1	0.07	0.023	0.23	**2.96**	0.30

ND = Not Detected

It should be noted that TRVs for the short-tailed shrew could not be derived for iron because there was not enough information available in the literature on the toxicity of this metal to mammals. Therefore, the potential risk posed by this metal to soil invertebrate-feeding mammals at the Town of Salina Landfill is uncertain. Finally, although Aroclor 1260 was identified as a COPC in this risk assessment, it was not detected in earthworm tissue, surface water, or surface soil; therefore, it was not evaluated in the food chain model for the short-tailed shrew and it is not expected to pose a risk to soil invertebrate-feeding mammals.

7.5 Assumptions and Uncertainties

The ecological risk assessment is based on the following assumptions and uncertainties, which should be taken into account in the evaluation of risk:

- The aquatic ecological exposure pathway was not evaluated beyond the screening level step. Therefore, the risks posed to aquatic ecological receptors on or adjacent to the landfill are uncertain. However, since the landfill is part of the larger Onondaga Lake Superfund site, the ecological risks associated with Ley Creek sediments and surface waters were not evaluated as part of this project. It should be noted that some on-site ditches and swales are present on the landfill. Previous studies have identified a number of contaminants in the sediments and surface waters of these drainageways, including a few VOCs, many PAHs and other SVOCs, PCBs, DDT, DDD, and a variety of metals (Section 1.2.3). The degree to which the landfill contributes to the contamination in the ditches is uncertain, especially in light of their proximity to the New York State Thruway, from which surface runoff could be contributing to the PAHs and metals detected there, and the probable contribution to the contamination in Ley Creek. Although some fish were observed in these on-site surface waters, these areas are only expected to serve as temporary habitat for fish during periods of high flow, when the surface waters in Ley Creek fill these areas. Furthermore, the bottom substrate of these ditches and swales consists of fine muck and therefore would not be expected to support invertebrate communities. Nevertheless, these areas are a source of uncertainty with respect to the overall ecological risk that is present on-site.

- As discussed above, TRVs could not be derived for iron for mammals or for beryllium, iron, or thallium for birds. Therefore, the risks posed by these metals to avian and mammalian receptors at the site are uncertain. Similarly, toxicity values for earthworms were not available for eighteen PAHs, bis(2-ethylhexyl)phthalate, 4-chloroaniline, aluminum, barium, beryllium, cobalt, iron, manganese, silver, thallium, vanadium, and cyanide. PAHs were evaluated by comparing total PAHs to the toxicity value for fluorene, but the risks posed by the remaining contaminants to soil invertebrates at the site is uncertain.

- If a contaminant was not detected in a sample, its concentration was assumed to be one-half of its detection limit for that sample when calculating the mean concentrations for contaminants in surface water and soil. Similarly, to calculate total PAH concentrations, if an individual PAH was not detected in a sample, it was assumed to be present at one-half its detection limit in that sample. The maximum and mean total PAH concentrations used in this risk assessment were calculated from the resulting total PAH concentrations for each sample. These assumptions may have resulted in a slight overprediction of the hazard quotients for the contaminants and media to which these assumptions were applied.

- Since earthworms were the only organisms collected for analysis, the diets of the American robin and short-tailed shrew were assumed to comprise 100% earthworms. Since it is known that earthworms comprise the majority of the diets of the selected receptors, and since earthworms are expected to represent the bioaccumulation of contaminants by other soil dwelling invertebrates, the use of 100% earthworms in the diets of the American robin and the short-tailed shrew is not expected to significantly impact the conclusions of this risk assessment.

- To calculate the estimated exposure to contaminants by the receptors of concern using the food chain models, a variety of conservative assumptions were made. The available information on the life histories for the receptors was reviewed, and from this information, the smallest reported adult mean body weights, the smallest reported home ranges, and the largest reported mean ingestion rates were used to obtain a worst-case scenario for exposure to contaminants by these receptors. This may have resulted in an overprediction of exposure to contaminants by the receptors of concern, which may have resulted in an overprediction of risk.

- For birds, breeding territories rather than migratory ranges were used to calculate area use factors. Therefore, the portion of the year that birds migrate elsewhere was not accounted for in the area use factor. However, since most toxicity reference values were derived using dosing intervals shorter than seasonal migratory intervals, and since most of these values were derived using reproductive endpoints, the use of breeding territories to calculate area use factors is appropriate. Therefore, this assumption is not expected to have contributed significant uncertainty to the conclusions of this risk assessment.

- To derive TRVs for birds and mammals, a variety of uncertainty factors were used. For example, if the duration of a study used to derive a TRV was shorter than the duration considered to represent a chronic exposure, then the dosage obtained from the study was divided by an uncertainty factor of 10 to represent a chronic exposure. In addition, if only a LOAEL, and not a NOAEL, was available from a study, the LOAEL was divided by 10 to estimate the NOAEL. Similarly, if a study only provided a NOAEL, it was multiplied by 10 to estimate the LOAEL. These assumptions contribute to uncertainty in the conclusions regarding risk associated with the contaminants for which these uncertainty factors were used.

- A soil ingestion rate could not be found in the literature for the American robin. Therefore, the soil ingestion rate for this receptor was assumed to be equivalent to the reported soil ingestion rate (as a percentage of the diet) for a species with a similar feeding strategy (the American woodcock). This assumption contributes to the uncertainty in the conclusions of risk calculated using the American robin food chain model in this risk assessment.

- In some cases, toxicity values reported in the literature were reported as dietary concentrations (milligrams of contaminant per kilogram of food). These concentrations needed to be converted to daily dosages (in mg/kg BW-day) for receptors at the site. In some cases, the literature did not provide sufficient information on ingestion rates and body weights of the test organisms to make these conversions. Therefore, average ingestion rates and body weights for the test organisms reported elsewhere in the literature were assumed to represent the test organisms in the study of concern. Since average ingestion rates and body weights were used, and since most test organisms are commonly used laboratory species, these assumptions are not expected to have contributed much uncertainty to the conclusions of this risk assessment.

- The ecological risks to carnivores and other higher level ecological consumers (e.g., hawks, owls, and foxes) at the site are uncertain because these receptors were not evaluated in this risk assessment. Since observations of these predators were uncommon during the site ecological survey, these organisms may not utilize the site sufficiently to be at risk from site contamination. However, since risks were found to exist for invertebrate-feeding birds and mammals at the site from a variety of metals, and since many of these metals are known to bioaccumulate and biomagnify in the food chain, it is possible that any upper trophic level consumers that do sufficiently utilize the site could also be at risk from metals at the site.

Since food chain models were not performed for these receptors, these potential risks at the site are uncertain.

- The results of the analysis of earthworm tissue indicated that no PCBs were detected in earthworm tissue. Therefore, it was assumed for this risk assessment that the concentration of PCBs in earthworm tissue was zero. However, as discussed in Section 4.1.7, the analysis of earthworm tissue for PCBs was performed well outside of the holding time. Therefore, the accuracy of the PCB analysis results are uncertain. However, these data are nevertheless useful to indicate that elevated concentrations of PCBs are not present in earthworms. The fact that PCBs were not detected in any of the surface soil samples collected from the site supports this conclusion.

7.6 Overall Conclusions from the Ecological Risk Assessment

Based on the results of this ecological risk assessment, the contamination at the Town of Salina Landfill is posing a risk to soil invertebrates and terrestrial vertebrates. Specifically, using maximum contaminant concentrations in surface soil, a risk was calculated for soil invertebrates from total PAHs, chromium, copper, lead, mercury, and zinc. Using mean contaminant concentrations, a risk was calculated for soil invertebrates from chromium, copper, mercury, and zinc. Using the mean concentrations, chromium had the highest hazard quotient (HQ=118), while copper, mercury, and zinc had lower quotients (HQs ranging from 1.1 to 6.3). Toxicity values for soil invertebrates were not available for many other contaminants present in site surface soils, particularly, many PAHs, bromoform, 4-chloroaniline, bis(2-ethylhexyl)phthalate, Aroclor 1248, nine metals, and cyanide. PAHs were evaluated by comparing total PAH concentrations with the toxicity value for fluorene. However, the potential risks to soil invertebrates from the remaining contaminants for which no toxicity value was available are uncertain.

This risk assessment also indicates that, using maximum contaminant concentrations, soil-invertebrate feeding birds are potentially at risk from aluminum, barium, cadmium, chromium, cobalt, copper, lead, mercury, selenium, silver, vanadium, zinc, and cyanide. Using mean contaminant concentrations, soil-invertebrate feeding birds are at risk from aluminum, cadmium, chromium, cobalt, lead, mercury, selenium, silver, vanadium, zinc, and cyanide. Of these, chromium had the highest hazard quotients (HQs=67 and 6.7 using the NOAEL and LOAEL, respectively), while the remaining metals had lower quotients (HQs ranging from 1.3 to 26 using the NOAEL and 1.05 to 6.4 using the LOAEL).

The results of the ecological risk assessment also indicate that, using maximum contaminant concentrations, soil invertebrate-feeding mammals are potentially at risk from aluminum, arsenic, barium, cadmium, copper, lead, mercury, selenium, silver, thallium, vanadium, and cyanide. Using mean contaminant concentrations, a risk was calculated from aluminum, arsenic, barium, cadmium, lead, mercury, selenium, silver, thallium, vanadium, and cyanide. Of these, aluminum had the highest hazard quotients, with HQs of 259 and 26 using the NOAEL and LOAEL, respectively. The remaining contaminants had lower hazard quotients, ranging from 1.1 to 14 using the NOAELs and from 1.4 to 3.5 using the LOAELs. Toxicity values were not available for beryllium, iron, or thallium for birds, nor for iron for mammals. Therefore, the risks posed by these contaminants to these receptors are uncertain.

8.0 SUMMARY AND CONCLUSIONS

8.1 SUMMARY OF RESULTS

The following is a summary of results from the Remedial Investigation performed at the Town of Salina Landfill:

Background

- The Town of Salina Landfill was previously defined as approximately 55 acres in size.

- The land containing the site is currently owned by five different parties. The Town of Salina, John and Frank Parratore, East Plaza, Inc., Onondaga County, Niagara Mohawk, and The Onondaga County Resource Recovery Agency.

History

- There are no records indicating the actual date the Salina Landfill opened but it is believed to have opened in 1962.

- Reaching its capacity, the landfill closed sometime in late 1974 or early 1975, pursuant to an order by the New York State Department of Environmental Conservation (NYSDEC).

- In September 1981 the Landfill was covered with a two-foot clay-type soil and the area was hydroseeded to establish a vegetative cover. This project was completed in November of 1982.

Previous Investigations

- Prior Investigations were conducted between 1986 and 1997 by several agencies/companies. These companies included NYSDEC, NUS Corporation, Atlantic Testing Laboratories and Ecology & Environment Engineering, P.C.

    - In 1986 the NYSDEC collected three surface water samples and two surface soil samples. All samples were analyzed for PCBs. None were detected in the water samples, but PCBs were detected in the soil samples at up to 3.6 mg/kg.

- In 1987, the NYSDEC retained Atlantic Testing Laboratories to drill three borings on site, one of which was completed as a well. Several VOCs and several metals were detected in excess of standards in the groundwater sample, while Voices, PAHs, PCBs and a number of metals were detected in excess of standards in subsurface soil samples.

- In 1991 the NYSDEC contracted with Ecology & Environment, P.C. (E&E) to perform a Preliminary Site Assessment of the Salina Landfill. No sampling was conducted as part of this assessment.

- In 1993 the NYSDEC contracted with E&E to perform another Preliminary Site Assessment of the landfill. E&E collected 10 surface water samples, 10 sediment samples, 5 surface soil samples, and 3 leachate samples. Low concentrations of several chlorinated organic compounds were detected in surface water and sediment samples. PCBs were also detected in 8 out of 10 sediment samples. No groundwater sampling was conducted as part of this assessment. Based on these results, the report recommended reclassifying the site as a Class 2 site.

- In 1995 NYSDEC contracted again with E&E to perform a Preliminary Site Assessment Addendum of the Salina Landfill. The report summarized supplementary work at the site to better define the site stratigraphy, to evaluate whether a release to groundwater has occurred, and to determine the direction of groundwater flow. The groundwater was found to contain 6 VOCs, 1 PCB compound, and numerous metals in excess of standards.

- In 1996 and 1997 the NYSDEC collected sediment samples from the old Ley Creek channel. Results indicated that all the samples contained PAHs with benzo(a)pyrene, chrysene, and phenanthrene above sediment criteria. Samples also contained PCBs and a number of heavy metals above sediment criteria.

<u>Remedial Investigation Tasks</u>

- A Phase I field investigation was conducted between June 29 and September 30, 1998. This investigation included the following tasks:

- A topographic survey was conducted to develop a site-wide topographic base map in order to establish a standardized site plan upon which all site features and sampling locations could be plotted.

- An ecological survey conducted to document the ecological condition of the site, document whether actual or potential exposure pathways and ecological receptors exist at the site, and to gather data to be used in evaluating remedial alternatives.

- A wetland survey conducted during July 1998 with the habitat survey.

- A waste area investigation was conducted to delineate the limit of waste disposal at the site; determination of the thickness of waste; identification of the type of waste with special interest on potentially hazardous waste; determination of the extent and thickness of soil cover over the waste; determination of current methane gas migration; and evaluation of a former sanitary sewer as a contaminant migration pathway.

- A subsurface investigation was conducted which included excavation of 53 test pits, the advancement of 12 soil borings, the installation of 8 shallow monitoring wells and 3 deep monitoring wells.

- A multimedia-sampling program was conducted which included the collection and analysis of groundwater, leachate, surface water, sediment, subsurface waste, and surface soil. Groundwater sampling was conducted from the six existing and eleven newly installed monitoring wells.

• A Phase II investigation was conducted in August 1999. This investigation was intended to confirm results from the Phase I Investigation and/or add to our knowledge of the site. The work included:

  - Collection and analysis of groundwater samples from wells MW-0 and MW-10.

  - Additional subsurface soil sampling to identify the limits of the black oily sludge found during Phase I investigation.

- Collection and analysis of earthworm samples to determine the impact of site contaminants on biota.

- The advancement of 2 soil borings in the middle of Ley Creek to determine if waste existed beneath the bed of the creek.

<u>Results of Investigation</u>

- No NYSDEC-mapped wetlands were identified within the study area. The National Wetland Inventory (NWI) maps provided the location of three wetlands, including Ley Creek, within or adjacent to the study area and four within 0.5 miles of the site.

- In addition there are strips of wetlands on the edges of the landfill that were not identified on the NWI maps.

- Based on historical aerial photographs and analysis of Onondaga County soil maps it was determined that the Town of Salina Landfill was placed over an extensive wetland area.

- During the July 1998 survey 12 ecological communities were observed. The value of these communities to humans is minimal due to limited access to the site (private property) and other more suitable areas for outdoor recreation occur nearby.

- There was no indication of stress to vegetation in uplands or wetlands at the site although the wildlife of the site may be impoverished.

- The northern limit of waste is close to the Buckeye Petroleum pipeline that parallels the Thruway. The southern limit of waste essentially borders on the original channel for Ley Creek. The western limit of waste is close to the border between the Town of Salina property and property owned by OCRRA, although the waste encroaches onto OCRRA's property in the northwest corner of the site. The eastern boundary of the waste extends close to the western boundary of the commercial properties located along Route 11.

- The waste consisted of mostly of typical municipal solid waste, construction and demolition debris, and yard wastes. A black viscous material was also encountered in a number of places.

- A soil cover of approximately 2 feet in thickness was encountered over the majority of the site. The soil cover is thin to absent in the area located between the property owned by Niagara Mohawk and the north bank of Ley Creek and along the southern edge of the parcel owned by East Plaza, Inc. located between old Ley Creek and the main channel of Ley Creek.

- Testing of the soil cover indicated it has a relatively low permeability with values of 9.46×10^{-8} cm/sec and 9.32×10^{-5} cm/sec.

- The results of the methane gas survey indicate that the landfill is not actively producing methane to any significant extent.

- Groundwater on site is found in two water-bearing units on site. The uppermost water-bearing unit is unconfined while the lower unit is under confined conditions. At least some of the waste lies below the water table.

- The hydraulic conductivity for the water table aquifer ranges between 1.07×10^{-2} to 9.84×10^{-3} cm/sec. The hydraulic conductivity for the deeper confined aquifer is approximately 1×10^{-1} cm/sec.

- The groundwater flow velocity in the water table aquifer and the confined aquifer was estimated to be approximately 350 ft/year and 4,000 ft/year, respectively.

- Groundwater flow in the water table aquifer appears to be in a radial pattern away from the main landfill mound. Groundwater appears to be discharging to Ley Creek.

- Groundwater samples taken in both the Phase I and Phase II investigations show that the majority of the groundwater in the water table aquifer is relatively free of organic compounds. However, VOCs were detected at elevated levels in the southeast portion of the landfill, especially in well MW-10. PCBs were also detected at concentrations above the groundwater standard in 6 wells. Arsenic, cadmium, iron, magnesium, manganese, and sodium were detected in several on site wells in levels above groundwater standards.

- The groundwater in the confined aquifer was almost entirely free of organic compounds.

- Samples of the subsurface waste (particularly the black viscous material) contained very high concentrations of PCBs, several VOCs and PAHs and a number of heavy metals (e.g., arsenic, barium, cadmium, chromium, lead, mercury, and zinc).

- The contaminants in the surface soil include primarily PAHs and a majority of the metals that were analyzed. The surface soil is largely absent of VOCs and is absent of PCBs on the north side of Ley Creek. PCBs were detected in two surface soil samples on the south side of Ley Creek.

- Surface water sampling conducted in Ley Creek demonstrated the presence of Benzo(k)fluoranthene, aroclor 1248, iron and aluminum in concentrations exceeding standards. These compounds/metals appear to originate from the landfill.

- Sediment sampling conducted in Ley Creek demonstrated that PCBs and PAHs are present in significant concentrations upgradient of the site. These same contaminants are present in sediment samples collected from Ley Creek adjacent to the site.

- Sampling of leachate seeps present along the north bank of Ley Creek indicated the presence of few organic compounds. Of note, PCBs were present in the leachate in low concentrations.

8.2 CONCLUSIONS

The following conclusions were reached as part of this Remedial Investigation:

- The surface soils do not generally contribute to contamination of other media.

- The subsurface waste appears to be contributing to the contamination of VOCs and PCBs (in low concentrations) in groundwater.

- PCBs in the surface water migrate from the subsurface waste, through the groundwater and leachate.

- Sediments contaminated with PAHs and PCBs is probably largely derived from an upstream source.

- The human health risk assessment concludes that the COCs detected in environmental media at the site do not pose unacceptable noncarcinogenic health risks to potentially exposed populations at the site under a current land use scenario.

- The total hazard index for the construction worker in the future land use scenario was in exceedence of 0.1 (1.7). This value represents the cumulative effect of exposure to surface soil (ingestion and dermal contact), subsurface soil (ingestion and dermal contact), and groundwater (incidental ingestion only) at the site in the future. The groundwater route (HI = 1.48) represents the largest portion of the cumulative noncarcinogenic risk to construction workers. Thus, there appears to be a potential risk for noncancer health effects to this receptor in the future. The major COCs identified as contributing to the increased noncarcinogenic risk for construction workers were arsenic (for surface soil and subsurface soil), and arsenic, cadmium, and 1,2-dichloroethene (total) for groundwater.

- For the child trespasser receptor, the overall cancer risk (considering exposures to surface soil and leachate) in the current and future land use scenarios was 1.4×10^{-4}. This value exceeds EPA's acceptable cancer risk range, and, thus, elevated cancer risks to this population have been identified. The largest portion of this cumulative risk appears to be from dermal contact with surface soil (1.29×10^{-4}). The COCs contributing to the cancer risk for child trespassers are benzo(a)pyrene and benzo(b)fluoranthene for surface soil and Arochlor 1248 for leachate. The total cancer risk for the adult trespasser was below 1×10^{-4} (i.e., within the acceptable range of risk).

- The cumulative cancer risk for the construction worker in the future land use scenario (through exposures to surface soil, subsurface soil, and groundwater) was slightly higher than the acceptable range (1.2×10^{-4}). Thus, a cancer risk exists for this future receptor. The largest portion of the construction worker cancer risk appeared to be attributable to ingestion of and dermal contact with subsurface soil (combine medium cancer risk of 1.0×10^{-4}). Some of the COCs that appeared to contribute most significantly to the construction worker cancer risk were benzo(a)pyrene, benzo(b)fluoranthene, Aroclor 1248, and arsenic.

- Based on the results of this ecological risk assessment, the contamination at the Town of Salina Landfill is posing a risk to soil invertebrates and terrestrial vertebrates. Specifically, using maximum contaminant concentrations in surface soil, a risk was calculated for soil invertebrates from total PAHs, chromium, copper, lead, mercury, and zinc. Using mean contaminant concentrations, a risk was calculated for soil invertebrates from chromium, copper, mercury, and zinc.

- This risk assessment also indicates that, using maximum contaminant concentrations, soil-invertebrate feeding birds are potentially at risk from aluminum, barium, cadmium, chromium, cobalt, copper, lead, mercury, selenium, silver, vanadium, zinc, and cyanide.

- The results of the ecological risk assessment also indicate that, using maximum contaminant concentrations, soil invertebrate-feeding mammals are potentially at risk from aluminum, arsenic, barium, cadmium, copper, lead, mercury, selenium, silver, thallium, vanadium, and cyanide. Using mean contaminant concentrations, a risk was calculated from aluminum, arsenic, barium, cadmium, lead, mercury, selenium, silver, thallium, vanadium, and cyanide.

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